Successful Methods in Battery Service

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MOTOR AGE

Volume XXXV
Number 24

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CHICAGO, JUNE 12, 1919

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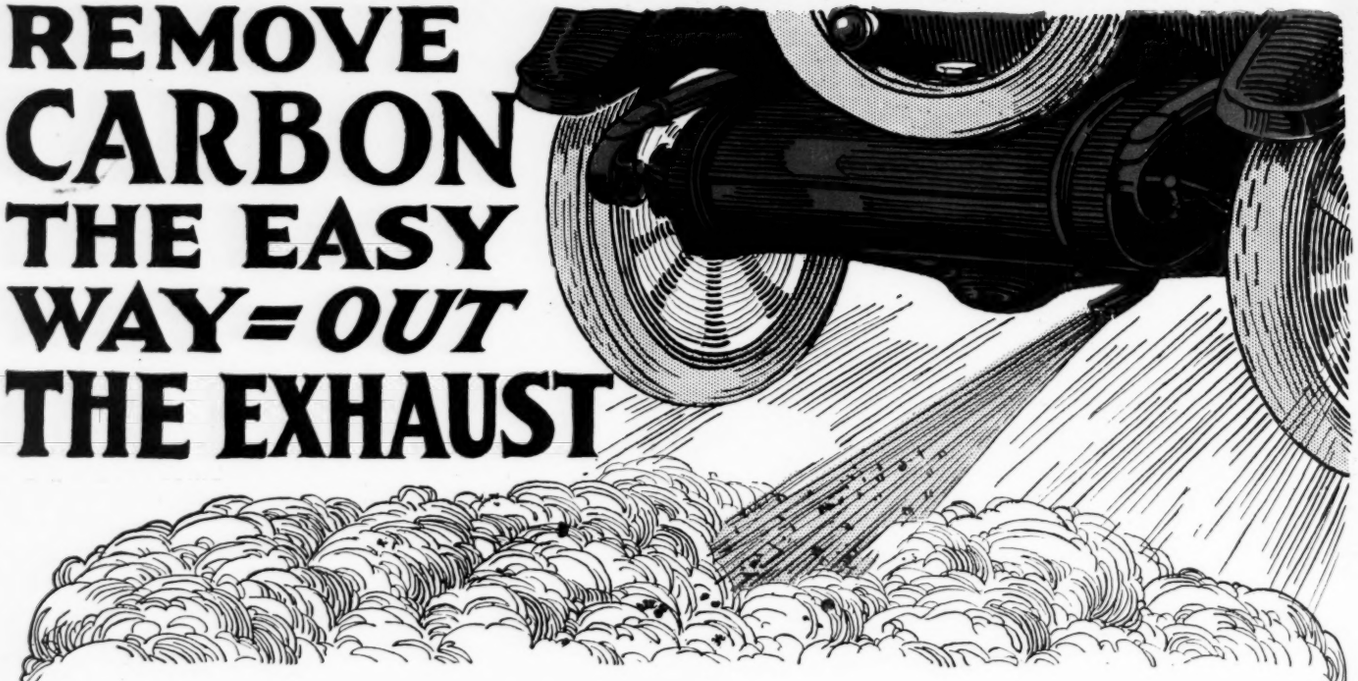
Three Dollars a Year

Hyatt
BEARINGS

U. S. BALL BEARING MFG. CO. *(Conrad Patent Licensee)* CHICAGO, ILL., U. S. A.

Entered as second-class matter Sept. 19, 1899, at the post-office at Chicago, Ill., under Act of March 3, 1879

REMOVE CARBON THE EASY WAY = *OUT* THE EXHAUST



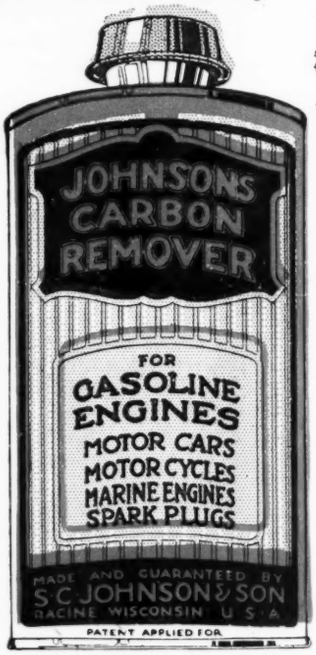
THE easiest, cleanest, safest and most satisfactory method of removing carbon deposits is with Johnson's Carbon Remover. It will save you from $3.00 to $5.00 over any other method without laying up your car and with much better results. After one application your car will run like it did the first five hundred miles—quietly and full of "pep"—and you will secure the maximum power and speed from the minimum amount of fuel.

Harmless—Easy—Efficient

Johnson's Carbon Remover is a harmless liquid to be poured or squirted into the cylinders. It contains no acids and does not affect lubrication or interfere with the oil in the crank case. Millions of cans have been used. Recommended by many of the leading car manufacturers, including the Packard and the Studebaker companies.

JOHNSON'S CARBON REMOVER

A dose of Johnson's Carbon Remover—the engine laxative—will cure 80% of engine troubles. It will increase the power of your car—improve acceleration—stop that knock—quiet your motor—save your batteries—cut down your repair bills—and reduce your gas and oil consumption.



Use It Every 500 Miles

Don't wait until your motor is choked with carbon—remove it every week or two with Johnson's Carbon Remover. You can do it yourself in five minutes—no mechanical experience necessary.

The regular use of Johnson's Guaranteed Carbon Remover will automatically eliminate most valve trouble and keep your motor clean, sweet and at its highest efficiency.

"Use Johnson's Carbon Remover in your Champion Minute Spark Plug Cleaner."

For sale by Hardware, Accessory dealers and Garages. Send for our booklet on Keeping Cars Young—it's free.

S. C. JOHNSON & SON, Dept. M.A., Racine, Wis.
Established 1882

MOTOR AGE

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"NORMA"
PRECISION
BALL BEARINGS
(PATENTED)

The "factor of safety" of a car, truck, tractor or power boat is no higher than the factor of safety of the weakest part entering into its construction. Which indicates the necessity for a fine balance of quality throughout, and emphasizes the fact that there is no "minor part" in an automotive unit.

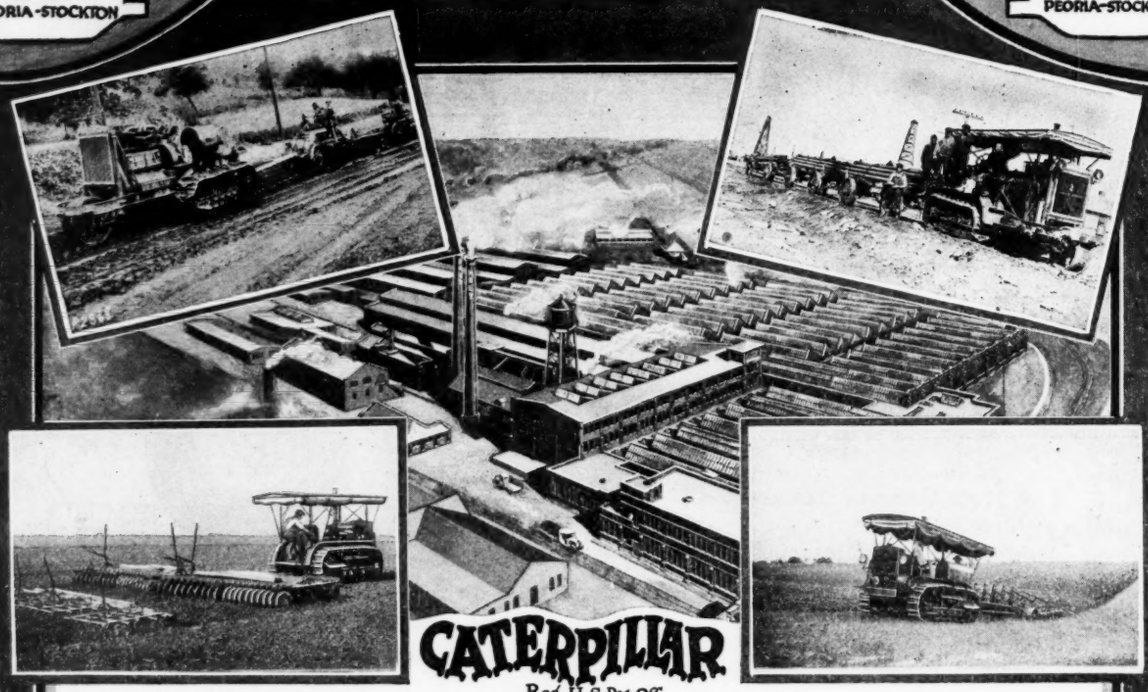
The proved service capacity of "NORMA" equipped magnetos and lighting generators—their high factor of safety to which the "NORMA" factor of safety contributes bearing dependability—have made them to be the accepted standards with builders who place serviceability before all else.

Be SURE. See that your electrical apparatus is "NORMA" equipped.

THE NORMA COMPANY OF AMERICA
1790 BROADWAY NEW YORK

Ball, Roller, Thrust and Combination Bearings

HOLT
PEORIA-STOCKTON



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PEORIA-STOCKTON

CATERPILLAR
Reg. U.S. Pat. Off.

"THE RETURN of the CATERPILLAR"

The "Caterpillar" tractor is once more available for agriculture and industrial use. *Before* the war the "Caterpillar gave agricultural and industrial users dependable and economical service. The Allied and U. S. Armies chose the "Caterpillar" as the Artillery and Supply tractor during the war when any failure would have meant disaster. The "Caterpillar" *made good* and won the enthusiastic endorsement of the world's greatest Army Engineers. Now, *after* the war you can obtain this same tractor with the refinements that have come from military service,—and many years of farm and road work in many countries.

The "Caterpillar will plow the softest land, the stiffest clay or the most stubborn sod; it will pull logs through the forest trails and transport heavy loads of ore over steep mountain grades and across wide stretches of desert; it is also fitted for the building and maintaining of roads and highways and for all work demanding a tractor of power and endurance.

Its self laying steel tracks give positive traction everywhere.

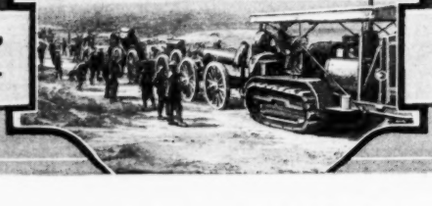
Our new models, 5 and 10-ton (ordnance types) will be shown at all National Tractor demonstrations. A "Caterpillar" agency obtained now assures a permanent and profitable business for dealer or distributor. Inquiries invited regarding available territory.

There is but one "CATERPILLAR"—*Holt builds it.*

THE HOLT MANUFACTURING COMPANY, Inc.

FACTORIES, PEORIA, ILL. **STOCKTON, CALIFORNIA**

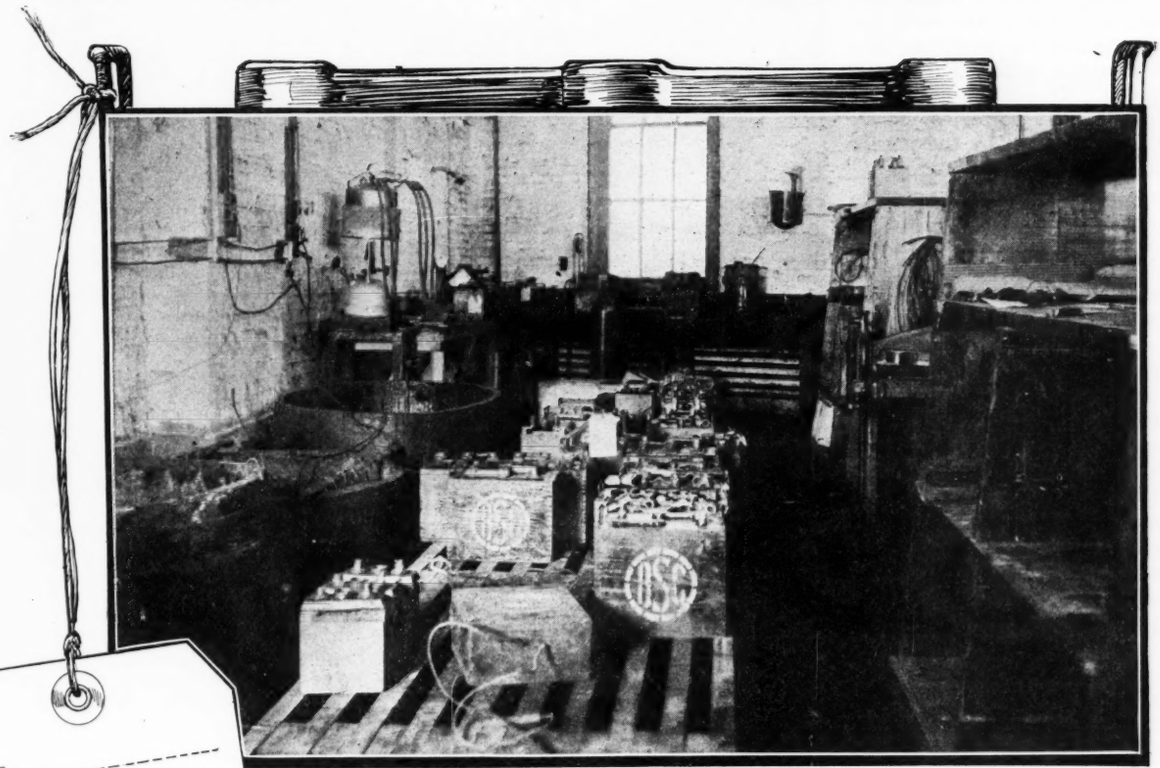
NEW YORK OFFICE
50 Church St.



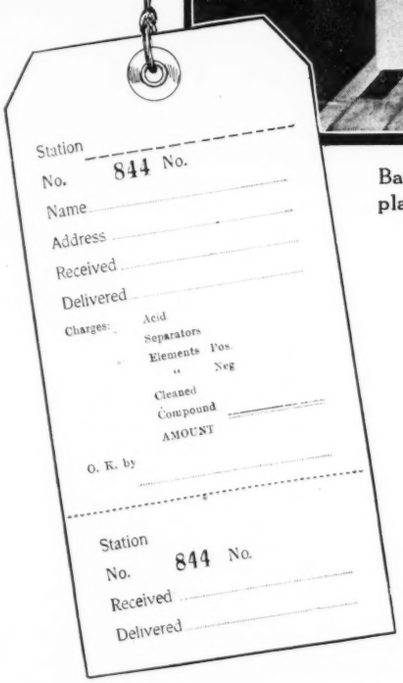
"CATERPILLAR" TRACTORS

Vol. XXXV, No. 24 Chicago, June 12, 1919 $3.00 Per Year

MOTOR AGE



Batteries ready for dissembling lined up on rack in center foreground; steaming plant with rubber hose attached may be seen to left in rear; in extreme rear center, part of workbench; on right, shelves for receiving batteries



Tag fastened to incoming batteries and which remains on it until the process of repair has been completed and the job O. K.'d at final inspection. The stub at the bottom is retained by the customer

Complete Battery Service All Year for $4 Flat Rate

Unconventional Methods of Attracting Trade and Handling Business Brought Success to This Concern

SINCE little along original lines has been done recently in the battery service field, a sharp lookout is being kept by the trade for anything in the way of new or improved methods that can be adapted. One concern which has departed from the conventional manner of doing business and which is profiting thereby is the Battery Service Corp. of Philadelphia. Useful hints may be taken from its manner of operation, which is the result of originality in certain directions, combined with years of experience in the line of storage and lighting batteries and general automotive mechanics.

At the start, the corporation's mode of attracting business is out of the usual rut. This is done in the following manner:

A contract is offered to the prospect to take complete care of his battery, including the necessary labor and recharging, for one year for $4.

All materials required for repairs, or rebuilding of the battery during the term of contract are supplied by the corporation at actual cost—meaning trade cost to the corporation—plus 10 per cent.

As additional inducements, loaned batteries are permitted to be retained two days free of cost, with a charge of 15 cents a day thereafter.

All batteries left for service are made ready within 24 hours.

All parts going to make up a battery are made at the plant and the corporation, being independent, or not tied up with any outside manufacturing concern,

is able thus to give service on any type, or make of battery.

Batteries are called for and delivered free. These calls are made with a ½-ton Vim delivery car, which carries extra service batteries in case of emergencies and a few tools.

The corporation appoints as its sub-agents, to work on commission, garage owners, accessory dealers and car dealers. There are twenty-five such acting service stations in Philadelphia, each of which is supplied with the contract forms mentioned. These sub-agents do no active work on the batteries merely taking them for collection by the plant's delivery car.

Branch offices carry stocks of supplies and batteries but will do no actual repair work, all of which is attended to at the main plant. This is open from 8 a. m. till 5 p. m. daily except Sunday and on Saturday from 8 a. m. till 2 p. m.

In the case of sub-agents, sixty to ninety days' credit is allowed, their commission being 20 and 35 per cent. As there is no profit in the $4 a year contract plan, it may be considered a type of advertising.

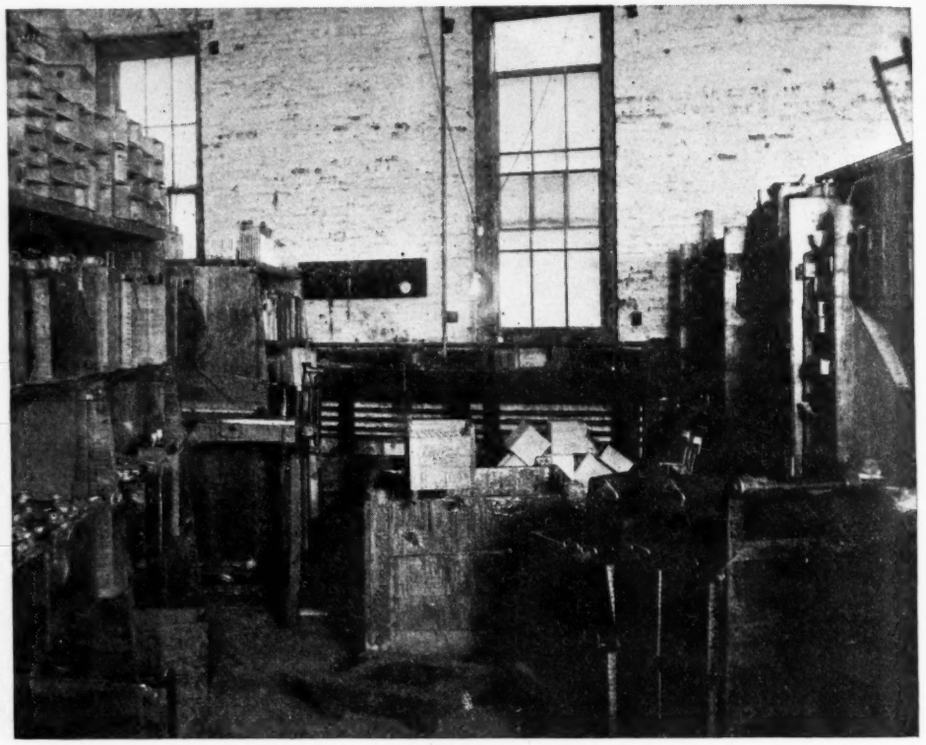
The corporation carries attractive display advertising in all the Philadelphia daily newspapers every week.

While each acting service station is considered a salesman in obtaining customers for the corporation, for instance, through the yearly contract, blanks for which are supplied to each sub-agent, the corporation has three salesmen in Philadelphia, covering respectively the northern, western and southern portions of the city. Thus far, the eastern portion, on testing, has not shown itself to be worth while developing at present.

Salesmen Call Daily

The salesmen, who do not work in the immediate territory of the sub-agencies, of course, call daily at the garages, accessory dealers and manufacturing plants in their districts.

Each salesman reports daily at headquarters, as a usual thing, but if he cannot come in, on account of working up to the last minute before closing time, and if his work begins in a faraway section again early next day, he mails to the corporation any requests he may have obtained for the service truck to call and take batteries for repairs.



Where the Battery Service Corp. makes batteries acid-proof, showing the dipping tank in the center

System of Repair

On arrival at the plant of a battery to be repaired, it is taken into the receiving room, the corporation maintaining that there should be such a room separate from the rest of the plant, especially if manufacturing is being done in the building.

Here a record is made of the battery's arrival, and a card, or tag, specially for the purpose, is made out to fasten on the battery, the customer or his representative receiving the detachable stub at the bottom of the card. The portion of the tag to be tied to the battery, and which remains on it through its course of repair, has spaces for the following entries:

Station number.
Name and address of customer.
When received.
When delivered.

and the following subdivisions to be checked, showing type of work done on it:

Charges,
Acid,
Separators,
Elements positive or negative,
Cleaned, and compound.

There is also a space for total amount of cost of repair to customer and a space for the examining expert's O. K.

The customer's stub has only spaces for station number, when received and when delivered.

Battery Is Inspected Next

After the battery has been checked in the receiving room it next goes to the inspection department, for preliminary inspection, where that portion of the tag not already filled in is completed with instructions issued as to type of repair. The battery is opened and examined by an expert, who quickly ascertains whether the trouble is with the plates, the wood separators or otherwise. The customer, if he waits for this examination, must be assured, according to the method of the corporation, what is wrong with his battery and the trouble fully explained, so that he may understand there will be no overcharging him for the work. Should the customer be waiting, not only is explanation made of the trouble with the battery, but it is brought to him and actually demonstrated.

The price of repairing is made consistent with good management, unless, of course, the customer is a contract one, in which case the $4 charge originally made covers all such work, ex-

BATTERY SERVICE CORPORATION

No.	NAME	ADDRESS	CONTRACT	S. B.	DEPOSIT	CHARGE	REPAIRING	CHARGING	SERVICE	TOTAL

Battery record kept on file in duplicate at the general office of the Battery Service Corp. of Philadelphia

Car dealers, accessory dealers and garage owners work for the Battery Service Corp. on commission. These sub-agents are allowed sixty to ninety days' credit, and their commission is 20 and 35 per cent.

Three salesmen cover Philadelphia in addition to the twenty-five acting service stations. They do not work in the immediate territory of the sub-agents but call daily at the places of the garage owners, accessory dealers and manufacturing plants in their districts.

Experts and specialists are employed by the corporation, so efficient service is guaranteed.

The price of repairs is consistent with the good management in effect. If the customer is a contract one, the $4 charge covers all such work except, as the contract provides, material or rebuilding. And at that material is supplied at actual cost plus 10 per cent.

cept, as provided in the contract, material, or rebuilding.

The customer, should he object to the price or for any other reason not care to have the battery go through the proper course of repair, is at liberty to say he will go no further with the process, in which case he is held only to the slight cost of examination and demonstrating.

If he wishes it repaired, which almost invariably is the case, the battery then goes from the preliminary inspection to the repair department.

The battery record, already mentioned, taken at the time the battery is received, consists of a form in duplicate, on buff paper, containing spaces to be filled in with the following items:

Number
Name and address of customer
Contract
Storage battery
Deposit charge
Repairing
Charging
Service

and total, in parallel columns, the blank being 9½ by 11 in. Both copies are retained in the executive office, one for the files and the other for reserve, in case the original should become misplaced, lost or illegible.

In the repair department a battery repair and labor analysis form, 6 by 4 in., is filled out with the following data:

Name of customer
Date of receipt of battery
Material
Labor
Time received
Time promised and cost.

For this the battery has to undergo a second inspection and then it is turned over to the shop superintendent with the proper instructions. The corporation emphasizes the importance of not having a separate inspection department, that is, isolated from the rest, if the business has not grown to large proportions, as with moving the heavier batteries about from one department to another the overhead is greatly increased in the aggregate.

Dismantling by Specialists

The next process is dismantling, which is carried out in a separate department by specialists, one force doing the first operation and another the second, that of receiving the positive and the negative plates. The groups of plates are examined carefully, thoroughly cleaned and tested by an inspector and a complete record made, which is given to the customer in duplicate, on request. The jars are thoroughly cleaned and tested also. The dismantling is done on the end of a long bench, so laid out as to promote efficiency of operation.

The battery now is ready for the next operation, which is assembling. This is done under the strict supervision of inspectors, and every element is examined closely before it is placed in the battery. Next the covers are replaced with care, the straps and terminals burnt on and the whole unit forwarded to the charging department, where it is received for electrolyte and recharging. This operation also is in the hands of a specialist who constantly keeps check to see that the voltage and amperage are correct. As soon as examination has fully satisfied him that the battery is in first-class

BATTERY REPAIR AND LABOR ANALYSIS.

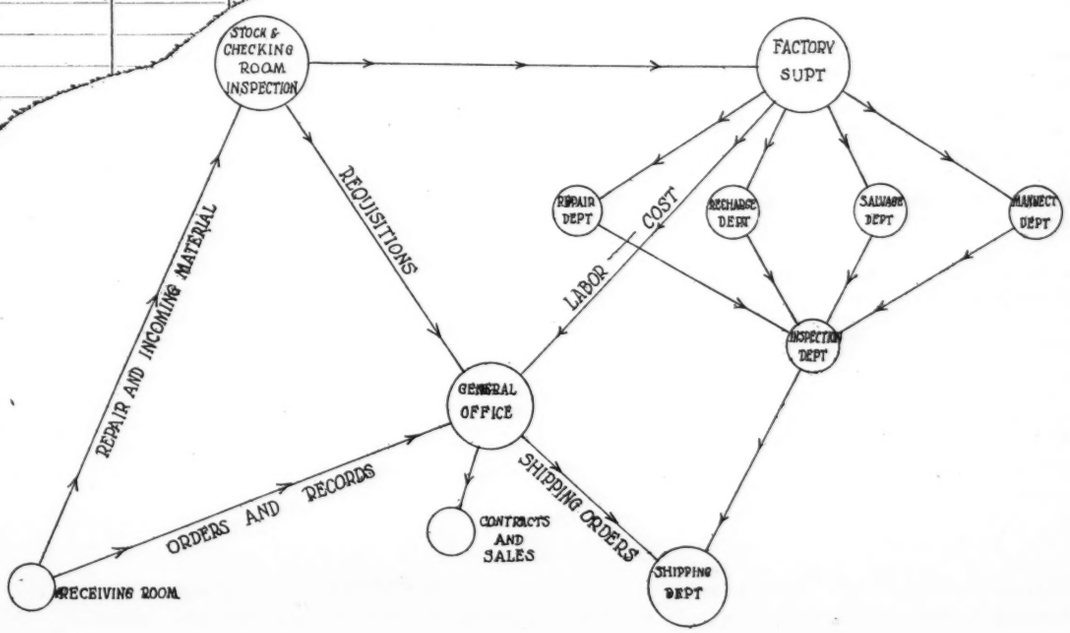
NAME

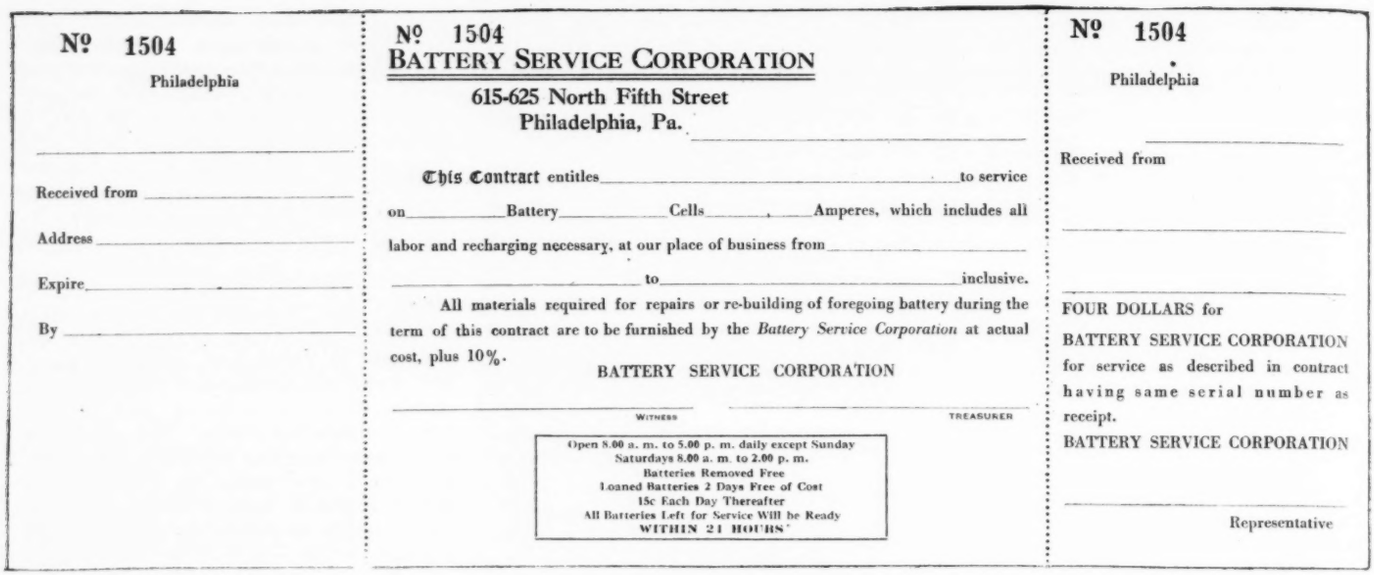
DATE

TYPE	MATERIAL	LABOR	TIME RECEIVED	TIME PROM.	COST

Battery repair and labor analysis form above, used by the Battery Service Corp.

Below is the chart of procedure in operation illustrating method in use by the Battery Service Corp. of Philadelphia, an example of directness and simplicity in putting business through from receiving room to shipping department





№ 1504
Philadelphia

Received from _____

Address _____

Expire _____

By _____

№ 1504
BATTERY SERVICE CORPORATION
615-625 North Fifth Street
Philadelphia, Pa.

This Contract entitles _____ to service on _____ Battery _____ Cells _____ Amperes, which includes all labor and recharging necessary, at our place of business from _____ to _____ inclusive.

All materials required for repairs or re-building of foregoing battery during the term of this contract are to be furnished by the *Battery Service Corporation* at actual cost, plus 10%.

BATTERY SERVICE CORPORATION

WITNESS _____ TREASURER

Open 8.00 a. m. to 5.00 p. m. daily except Sunday
Saturdays 8.00 a. m. to 2.00 p. m.
Batteries Removed Free
Loaned Batteries 2 Days Free of Cost
15c Each Day Thereafter
All Batteries Left for Service Will be Ready
WITHIN 24 HOURS

№ 1504
Philadelphia

Received from _____

FOUR DOLLARS for
BATTERY SERVICE CORPORATION
for service as described in contract having same serial number as receipt.
BATTERY SERVICE CORPORATION

Representative

Form of contract issued by the Battery Service Corp. of Philadelphia, whereby the corporation guarantees to take care of customer's battery for $4 a year

condition, he calls for the inspector who thoroughly tests it. If it proves correct, it is O. K.'d again.

On final inspection the battery is filled with sealing compound to make it tight, and the job is completed for shipment of the battery.

The corporation maintains an elaborate card index system, the type of form being virtually the same as that used for the repair and labor analysis, although all those entries are not filled out on the form. In the card index filing cabinet in the executive office are the following drawer divisions:

Garages
Contracts
Individual contracts
Motor car dealers
Supply dealers and repairmen
Salesmen
Service stations, and
Employees.

Average Battery Life

According to the findings of the corporation, the average battery life appears to be about three years, with proper care exercised. Batteries vary in their need for charging, of course, according to use, recharging ranging from once to four times a year, but the usual number of times batteries are recharged is three.

The corporation has a theory that it is better business to keep the generator running all the afternoon and night and to shut it down in the morning for several hours to cool. The generator is isolated.

The corporation has an arrangement with an insurance company, whereby, when insuring motor cars for patrons, if desired, it will have them sign the corporation's $4-a-year guaranteed service contract.

The accompanying chart shows the method of having batteries received progress through the institution for shipping to the customer.

The chart shows that from the receiving room the batteries go to the stock and checking room for preliminary inspection, orders and records from the receiving department at the same time being sent directly to the general office. From the stockroom requisitions proceed to the general office, while from stockroom and preliminary inspection the batteries go to the factory superintendent. From this point last mentioned, the logical procedure of repair department, recharge department, salvage department and manufacturing department follow, in each of these cases the result going to the inspection department to be passed on. From the factory superintendent, also, go out to the general office his findings on labor and cost. From the general office proceed contracts and sales and shipping orders, the latter, of course, being dispatched to the shipping department, thus ending the process.

This factory chart is the result of the study of the corporation and may be of value in illustrating directness and simplicity of operation.

The officers of the Battery Service Corp. are E. Ashworth, president: W. Knoblock, vice-president and treasurer; and A. Solomon, secretary. The corporation has in mind plans for expansion which will be utilized as soon as developments warrant.

TO ANNOUNCE STATE DETOURS WEEKLY

Harrisburg, Pa., June 6—Beginning June 9, the Pennsylvania highway bureau of information will furnish to all the daily newspapers in Pennsylvania information filed each week by the fifteen district engineers in Pennsylvania, covering every detour in each district. The information will be as follows: Location of detours, description and condition of detours, whether state highway, state-aid, township, or private road, the approximate date detour was placed or is to be placed and the approximate date of removal of detour. Postcard reports to the state department each week from the engineers also will furnish information of a more general description as to detours. A large map has been prepared in the office of the department here, on which the various detours will be traced.

In this way it will be possible for all motorists each Monday to clip from the newspapers information concerning all detours in the state. The bureau of information also will supply detour data to the motor clubs of Pennsylvania, many of which are preparing to place special bulletin boards in their headquarters. The department also has placed orders for metal detour signs which will point the proper roads.

WILMINGTON TRADE ORGANIZES

Wilmington, Del., June 6—After various attempts the trade of Wilmington has formed a substantial business association known as the Wilmington Automobile Trade Association. The following officers have been elected: President, W. A. Macdonald; vice-president, E. L. Bixby; secretary, E. C. Ulrich; treasurer, E. F. Merrick.

Some details as to future plans are yet to be worked out. Some want weekly meetings the year round as a sort of clearing house proposition, which is one of the aims of the organization, while others want meetings discontinued in summer.

The purpose is to solidify and harmonize the trade here, so as to co-operate along general business lines for the benefit of all. As this organization replaces the Wilmington Automobile Association, formed primarily to promote the annual shows, this latter function will be assumed by the new body, and already are being made for next year's show.

Motor Car Show in Paris

Fifteenth French Exhibition to Be Staged in Grand Palais Oct. 9-19

First One in Europe Since Beginning of War

PARIS, May 22—Oct. 9-19 inclusive have been fixed as the dates for the fifteenth French motor car show which will be held in the Grand Palais in Paris. This is the first to be held in Europe since the war and will inaugurate the series to be followed up by London and Brussels.

American manufacturers are placed at a disadvantage compared with European makers. One of the rules states that allied manufacturers can be admitted on the same footing as French makers, provided they have taken part in at least three previous Paris shows and also provided the import duties in their own country prior to 1914 were not higher than 15 per cent ad valorem. As the United States is the only country in the world having a duty higher than 15 per cent, it is evident that this rule has been adopted entirely with the object of handicapping the American exhibitors. The regulations state that foreign exhibitors who do not fulfil these requirements will be given special spots decided on by the committee. This practically means that they will have to take whatever spot may be available after everybody else has made a selection.

When the war broke out in 1914 numerous firms had made a request for space and in many instances had deposited the entry fees for the 1914 show; these firms will receive preferential treatment when space is allotted.

No enemy firm can exhibit at the Paris show.

Stands will be decorated and will be delivered completely equipped with signs, carpets, etc., ready for receiving the actual exhibits. As in previous years, a refund will be made to all exhibiters after expenses have been paid. The Grand Palais, which is the biggest hall under one roof in Europe, if not in the world, has been occupied by the militaries during the whole of the war. It has been released and is being repaired and equipped with the show in view. There is no doubt that every inch of space will be occupied. The president of the show committee is Baron Petiet, president of the French Society of Automobile manufacturers. Henri Cézanne is the general manager of the show.

LARGE ACCESSORY CORPORATION

New York, June 9—The Nemours Trading Corp. has been formed with a capital of $12,000,000 to take over the Allied Industries Corp., French-American Constructive Corp. and the Merchant & Manufacturers' Exchange, the last of which owns the Grand Central Palace, to be used as headquarters for the new corporation as soon as it is released by the Government. Associated with this corporation will be Bonright & Co., bankers.

The Nemours Trading Corp. is incorporated as domestic and foreign manufacturers' representatives and general shipping merchants. They are exclusive sales representatives of Wondermist polish, made by the Wondermist Mfg. Co., Boston, Mass.; Woodworth tire and bead spreaders, made by the Allied Industries Corp.; King crank holder and McCulloch timer, made by the A. P. McCulloch Machine Co., Boston, Mass. Others will be added to the line from time to time.

SHEEPSHEAD RACE ENTRIES

New York, June 9—A program of four events, a 10- 20-, 30- and 50-mile race, is scheduled for the Sheepshead speedway June 14. The 20-mile event is to be an invitation race for non-professional drivers. The two entries for this event received by the contest board of the American Automobile Association so far are:

W T. Comerford.....Stutz
Eddie O'Donnell.....Duesenberg

Professional entries include:

Driver	Car
Resta	Resta
Joe Thomas	Mercer
Louis Chevrolet	Frontenac
Ira Vail	Hudson
Denny Hickey	Stickel
J. M. Reynolds	Frontenac
Dave Lewis	Meteor
Tommy Milton	Duesenberg
Ralph De Palma	Packard
Rene Thomas	Ballot
Albert Guyot or Louis Wagner	Ballot

DUNLOP STUDIES CONDITIONS HERE

New York, June 10—Special telegram—George Du Cros, J. V. Worthington and F. C. Baisley, directors and executives of the Dunlop Rubber Co., England, are in the city. They are here to study existing conditions in the automotive and tire industries. Various rumors now circulating in regard to their plans are not to be taken too seriously, they state.

HICKEY WAS NINTH IN RACE

In rechecking the times for the 500-mile race Vail was given eighth place instead of Hickey, and in the table of winners which appeared in MOTOR AGE Hickey was not placed at all. However, Hickey, who drove the Stickel, merely dropped to ninth place when Vail was given eighth. This put Thomas in the Ballot eleventh, with Gaston Chevrolet tenth instead of ninth.

PROJECTS FOR 11,350 MILES OF ROAD

Washington, June 6—Projects for improving highways totaling 11,350 miles, to cost $108,295,329 and on which Federal Aid amounting to $43,076,176 was requested, have been approved by the Bureau of Public Roads to date. This includes 1188 projects, of which 813 miles have been completed at a cost of $6,870,451, of which $2,692,491 was paid in the form of Federal Aid by the Government.

National Show Dates

New York Exhibition Jan. 3-10 and That at Chicago Jan. 24-31

Truck Events on Same Dates at Both Places

NEW YORK, June 6—The dates for the national 1920 motor car shows have been set. That at New York will be held Jan. 3-10 in the Grand Central Palace, while the Chicago show will be held Jan. 24-31 in the Colieum.

Truck shows will be staged in both cities the same dates. The place of the New York truck show has not been decided, but the Chicago truck show will be held in the Drexel pavilion in the stockyards section. S. A. Miles will be manager again.

The directors of the National Automobile Chamber of Commerce decided on these dates at their meeting here this week.

The chamber passed a resolution endorsing the work of Col. Arthur Woods, assistant to the Secretary of War, in providing employment for men discharged from service and called on all members to give special attention to those classed as unskilled laborers before entering the war and who now are ambitious to obtain the technical training necessary to make them able to fill jobs as skilled laborers.

Colonel Woods called the attention of the industry in a statement to the larger number of men who are returning from service who have become qualified in every way for jobs as skilled labor except in technical training.

WHITE TO MAKE NEW CAR

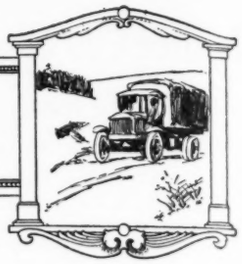
Detroit, June 9—D. McCall White, formerly vice-president of the Cadillac Motor Car Co., has opened temporary office in Detroit, where he is getting out the preliminary designs for a new car he is going to manufacture. The location of his new establishment has not as yet been definitely determined.

CASE BUYS GRAND DETOUR

Chicago, June 9—Within a few days official announcement of the purchase of the Grand Detour Plow Co., Dixon, Ill., by the J. I. Case Threshing Machine Co., Racine, Wis., will be made. The deal has been under way for several weeks but owing to a delay in fixing the details the fact of the purchase has not become public property.

By this new implement coalition the Case company secures control of one of the best established tractor plow lines in the industry. The Dixon company has been manufacturing plows and other farm implements since 1837, it being one of the oldest concerns in the business and sharing with Deere & Co. the honor of being the pioneer in the steel plow business.

EDITORIAL



What the Truck Tours Will Do

THIS week some forty-five or more trucks are carrying the gospel of the truck through the highways and byways of western Illinois and northern Missouri. It is not the first one of its kind. It is not the last. For truck interests of the Chicago territory are planning an even more ambitious program for a tour with two months as its life and several states as its route. They all are bringing home the idea of motor transportation and, incidentally, good roads.

IF SEEING really is believing, these truck expeditions are going to spell increased prospects for the trade as a whole. When Georgia held its ship-by-truck parade between cities this spring, the business was helped wonderfully in that neighborhood. Succeeding expeditions, parades and tours have added to the good work. While truck sales have been slow, in certain sections especially, partly due to the unfounded expectations that the Government would put many of its trucks on the markets, the situation already has been bettered and there is every reason to believe trade is going to continue to pick up. Meanwhile the truck tour is doing for the truck trade what motor car tours have done for the motor car trade.

Tractor Sales Organizaiion

COMPLAINT is general from all sections of the country that the tractor trade has been lagging. This is admittedly true as respects a majority of the machines offered for sale. Yet it is by no means universally true.

TRACTORS of certain makes are being sold in certain sections of the country in considerable, if not entirely satisfactory, numbers. Nor does this appear to be because the tractor itself is so attractive, nor to be the attitude of the farmers particularly favorable. Rather trade seems to come to these tractors because the selling organization is up on its toes and because the individual dealers are onto their jobs.

THE observer who sees these things personally must conclude that it is efficient sales organization, careful and considerate investigation of local needs, intelligent meeting of local conditions and the assurance of ultimate service that is putting the tractor across. Where these things exist, tractors are being sold in the face of a situation which has slowed up the trade in general. The moral seems to be that if a sales organization of the right kind is secured tractors will sell.

"A Friend in Need"

LIKE the old axiom that a friend in need is a friend indeed, the National Automobile Chamber of Commerce is proving a very mine of strength behind its constituents. It has taken up the gauntlet in defense of the dealer against the prohibition menace and pledges "adequate financial" support as well as that of the machinery of the organization to the Georgia dealers, who now are fighting the case. In numerous dry states Revenue agents have confiscated cars carrying liquor and in a majority of these cases the cars have been sold by the dealers on conditional bills of sale. For the dealer there is little or no redress. After the cars are seized they are sold or destroyed and in many cases the dealer not only is deprived of the car but it is impossible for him to recover the balance due. This notwithstanding the fact that the dealer had no knowledge of the purpose for which the car was to be used.

THIS condition is of importance to every dealer in the country, and that the N. A. D. A. recognizes this fact is readily evident from the stand it has taken on the matter. The industry has fought too long for the position it now holds in the business world to permit this state of affairs to continue long. The industry cannot afford to stand by and see the situation come to such a pass that the Federal Reserve banks refuse to re-discount dealers' commercial paper when cars are sold on such conditional bills of sale. Yet this is what the Federal Reserve banks are considering. The industry cannot afford to stand by and see the car insurance field added to in its complexities, for this situation already has impaired seriously the ability of car owners to insure their cars.

NO dealer can disown this state of affairs as one of interest and of influence in his own case. After national prohibition becomes effective, this condition, now prevalent in the dry states, will be prevalent over the entire United States and will affect every dealer and every manufacturer. Only immediate action, and that concerted action, action backed up by the strength of the industry, can be of avail. The N. A. D. A. is strongly to be commended for its step in this matter, and the support of all the dealers in the country as well as of the industry as a whole, surely should be given.

Roads for the Bumper Wheat Crop

SOME folks got together the other day and had a road meeting over in northern Illinois, and what do you think cropped up? One farmer got the floor and, waving his arms for emphasis of the sincerety in his heart, said something like this, "What're we waiting for anyway? Here's all this wheat to get to market and no roads to get them there on. We've got to get to work and get good roads." And he's right. With the Government guaranteeing $2.26 a bushel for the biggest bumper crop of winter wheat in history, nobody wants bad roads to stand between him and the market. It is time to get to work, not only in Iowa but every state, and get good roads from every farm to the nearest town.

THE main idea right here also is that with a bumper crop of winter wheat and a guaranteed price of $2.26 a bushel, we can afford good roads and we can afford trucks on the farm to haul that wheat, with cars to do the errands in.

Here It Is! Right Off the Press—"Welding"

Starting with the June 26 issue of MOTOR AGE the first installment of a series of articles on welding will be offered. A more complete and concise exposition of the best methods of welding in automotive repair never was published before. Scores of detail drawings and illustrations, showing step-by-step processes, only to be had in MOTOR AGE, will be used. The author has spent years of his time and study in the repairshop and from his knowledge gives you the information first hand.

This Is Your Opportunity to Learn Welding

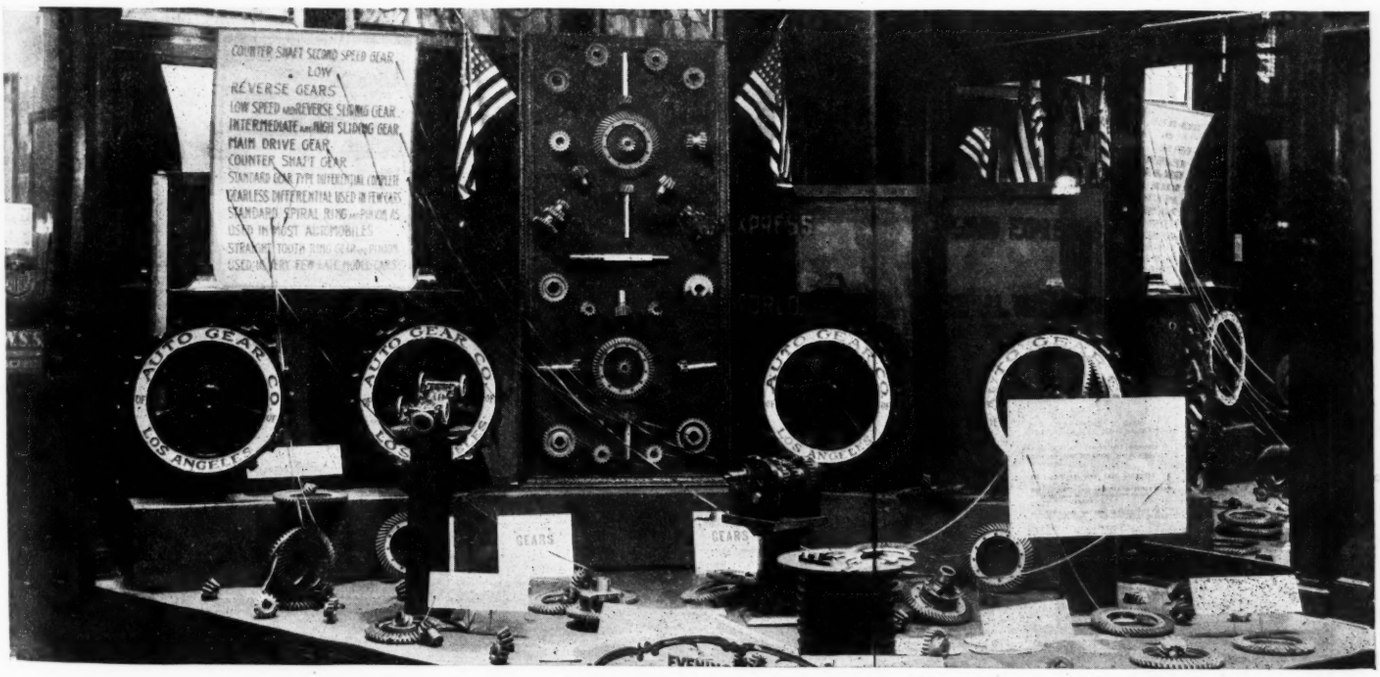
Every modern garage and repairman must understand welding and its uses to make the most of his opportunities. Welding is an economizer. It will save you hours of time for replacing and the cost of new parts. Follow each of the articles to be published, consume all the instructions, and you will be well reimbursed for your application to this interesting work.

Don't Miss the First Article—Be Johnny-on-the-spot Waiting for It

Right off the start you will be interested. There is no monotony to any of this series. Every paragraph is educational and instructive—but easy to read. MOTOR AGE has compiled important data on welding and co-ordinated this series so that when the reader concludes these articles he is prepared to step into this field with all the information necessary to carry on or supervise repairs by welding—also methods of oxy-acetylene carbon removal.

—Starts June 26 Issue—

Those With "Dull" or "Uninteresting" Parts to Display Take Notice!



"It occurs to us," said the Auto Gear & Parts Co., Los Angeles, Cal., in sending this in, "that this window idea might appeal to some of your readers who have 'dull' or 'uninteresting' parts to show up in their windows. Around the front of the window we aranged a series of gears which were taken out of the machines on account of breaks and were caused by carelessness in driving, shifting and adjusting of the parts. This proved to be a real educational feature which caught and held the eye of the passers. Note the small model of a car which has complete gearset, differential and so on." This window attracted quite a little interest from the Los Angeles public

N. A. D. A. to Fight Confiscation

Bone Dry Law Threatens Industry—Cars Sold on Terms Taken by Revenue Agents

ST. LOUIS, MO., June 7—The confiscation of motor cars containing liquor in dry states by Federal Revenue agents was recognized as a growing menace to the industry by the directors of the National Automobile Dealers' Association, in session here Monday and Tuesday, and steps were taken to check it. For the first time in the history of the association every director and officer was present.

The seriousness of the situation was made more apparent when it was considered that the whole nation soon will be under prohibition laws. It was developed that in a majority of cases the cars have been sold by the dealers on conditional bills of sale. The cars either are sold or destroyed after they are seized by the revenue agents. The dealer thus is deprived of his car, and he is unable in many cases to recover the balance due on the purchase.

A case in point has been upheld in the United States circuit court of appeals in Georgia, although the dealer had no knowledge of the purpose to which the car was being used. Similar cases are pending in Colorado, Washington, Virginia and California.

Imperils Rediscount of Dealer Paper

The condition is made more serious by the fact that the Federal reserve banks are considering a proposal to refuse to re-discount motor car dealers' commercial paper when cars are sold on such conditional terms. It also has impaired the ability of owners to insure their cars.

A pledge of "adequate financial" support was made by the directors to the Georgia dealers who are fighting this case. It will be taken to the United States supreme court, and if lost there, the N. A. D. A. will work to have the law under which cars are confiscated repealed.

Resolutions were adopted pointing out the danger to the industry of the confiscation laws, outlining the plan of campaign against it, soliciting the National Automobile Chamber of Commerce to join with the dealers morally and financially in defending the Georgia case to the Supreme Court and asking the chamber to send a representative to the Georgia State Dealers' Association in Macon, June 6, to join with the representative of the N. A. D. A., in a pledge of the situation were adopted. The resolutions, as sent to the manufacturers, follow:

"The directors of the National Automobile Dealers' Association, meeting in St. Louis submit:

"That, whereas, under section 3450 of the revised statutes of the United States, the Revenue officers of Georgia, Virginia, Washington, Colorado and the like have been confiscating motor cars in which liquor is carried, either upon which liquor. Federal revenue tax has not been paid or which is carried into dry territory in violation of provisions of the Reed amendment(the bone-dry law) and selling such cars or destroying them,

"And that, whereas, a number of these cars have been sold by the dealers under conditional bills of sale, and that

"Whereas, when cars so confiscated or thus sold, regardless of any knowledge on the dealers' part that such cars were to be used by purchaser for unlawful use, and that

"Whereas, as a result of such confiscation dealers are losing their motor cars; in many cases also the balance of money due on such cars, and that

"Whereas, because of such confiscation insurance companies are refusing to write theft insurance on such cars so sold conditionally and are withdrawing from many of the states and

"Whereas, the Federal Reserve Banks are considering the refusal to re-discount dealers' commercial paper on such conditional bills of sale, such action threatening the security of the dealers' business and seriously impairing their ability to fulfill their obligations toward their manufacturers and

"Whereas, after national prohibition becomes effective this condition now prevalent in the prohibition states will be prevalent over the entire United States, affecting every dealer and every manufacturer.

"Be it resolved that the directors of the National Automobile Dealers' Association pledge their financial support and the support of the machinery of their organization to defending a case now in the Circuit Court of Appeals of the United States, sitting in Georgia, and

"Be it further resolved that the National Automobile Dealers' Association respectfully solicit the National Automobile Chamber of Commerce to join with the dealers morally and financially in defending the Georgia case to the Supreme Court of the United States, that a precedent may be established for the entire country, and

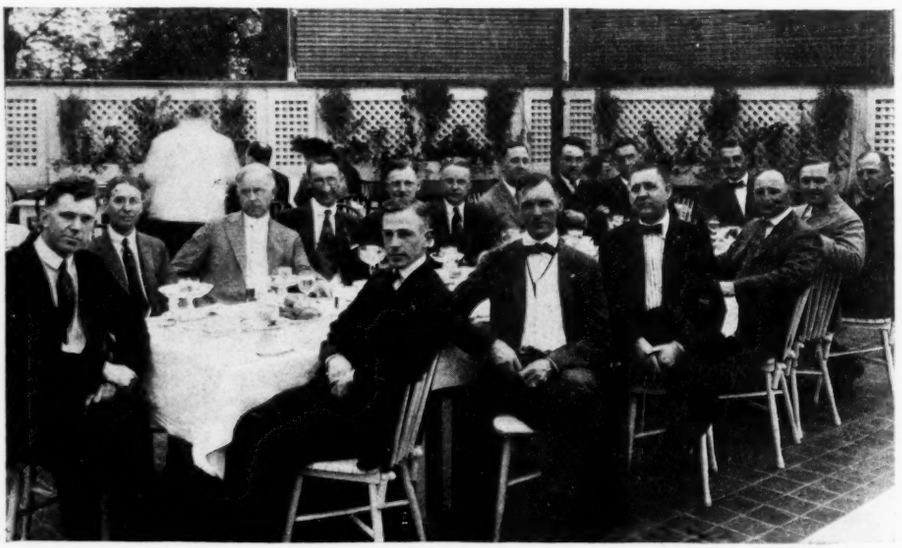
"Be it further resolved that the National Automobile Chamber of Commerce send a representative to the Georgia State Dealers' Association meeting in Macon, June 6 to join with the representative of the National Automobile Dealers' Association in a pledge of the situation."

Alfred Reeves, general manager of the National Automobile Chamber of Commerce, replied to this as follows:

"Thanks for your telegram containing greetings and co-operation. You have the same thought from our car manufacturers. Met Congressman Fordney yesterday. He will try to arrange for meeting with you and others in attendance, but uncertain at this time. New rulings from Treasury Department on truck chassis and parts taxes given me at Washington mailed to you. Think they are highly helpful, thanks to efforts of your association and others."

For Repeal of Taxes

The directors discussed methods to be pursued in obtaining the repeal of the 5 per cent tax on motor cars and parts and the 3 per cent tax on trucks. A telegram signed by all the directors was sent to Senator King of Utah, commending him for introducing joint resolution



All the officers and directors of the N. A. D. A. were present at the St. Louis meeting for the first time

No. 26, providing for the repeal of this section of the War Revenue act. The telegram states that the directors "feel that the taxes on motor cars, trucks, parts and accessories levied in the act impose an unjust and restrictive burden upon the industry, that they impose a penalty upon the manufacture and sale of motor cars and trucks and endanger the welfare and the safety of 900,000 workers in the nation's third largest industry and impair the credit of more than $1,000,000,000 invested in the industry."

The modified ruling of Internal Revenue Commissioner Roper in respect to the truck chassis tax is still unsatisfactory to the directors of the N. A. D. A. and in a telegram signed by all of them they submitted:

"That Treasury Department ruling of June 3, modifying Article 15, regulations 47, that a 'chassis equipped provided with a superstructure of such design that it is without substantial additions adaptable for hauling heavy loads in an automobile truck or automobile wagon and taxable at the rate of 3 per cent,' and that 'a chassis not so equipped is an automobile taxable at the rate of 5 per cent,' is not just inasmuch as it ignores the fact that in trade usage the chassis is the unit of sale and universally disposed of by the manufacturer and dealer without any superstructure.

Classification Called Unjust

"It is further declared that the classification is unjust because of the impossibility of dealers furnishing their manufacturers with certificates of the purpose for which such trucks chassis are to be used, as dealers buy great numbers of chassis, which stand on their floors before disposed of to customers and that virtually in all of these instances the dealer would himself be unable to give the assurance demanded."

The association has asked local trade associations to protect against the modifications as issued and to ask that the decision be made on the basis suggested by the N. A. D. A.

Resolutions were adopted supporting the Townsend Federal Highway Commission bill, which purposes to create a national highway commission with jurisdiction over highways similar to that exercised by the Interstate Commerce Commission over railroads.

The association sent a protest to the Treasury Department against a Revenue Bureau ruling that whenever a dealer adds a part or an accessory to a motor car and sells the car and the added part on one bill that he is a "further manufacturer," and subject to a 5 per cent tax on his total sale price.

Two bills in Congress—one in the House and one in the Senate—providing for Federal control of the motor car in interstate commerce were indorsed.

It was reported that the association is working on a uniform motor car tax for adoption in all the states regulating licensing, taxation, police regulation and liability for negligence and the like in the operation of cars.

The directors present were: F. W. A. Vesper, St. Louis, president; Harry G. Moock, St. Louis, secretary and business manager; W. J. Brace, Kansas City; P. E. Chamberlain, Denver; H. L. Robertson, Houston; Harry D. Austin, Seattle; A. E. Maltby, Philadelphia; George D. McCutcheon, Atlanta; J. A. Graham, Minneapolis; A. E. Mitzell, Canton; P. H. Greer, Los Angeles; E. W. Steinhart, Indianapolis and Thomas J. Hay, Chicago. John H. Johnson of Boston was named as director for the Eastern division.

The directors will meet next in Denver in October.

RAYFIELD COMPANY REORGANIZES

Chicago, June 9—The Beneke & Kropf Mfg. Co. has succeeded the Findeisen & Kropf Mfg. Co. and will make the Rayfield carbureters formerly made by the latter concern. With the reorganization of the company plans for the material expansion of manufacturing are formulated also. Henry Beneke, formerly vice-president of Hibbard, Spencer, Bartlett Co., has purchased the entire interests of Frederick Findeisen and becomes vice-president and treasurer of the reorganized company. O. F. Kropf remains with the company as active president, and E. A. Bates continues as director of sales and advertising.

The reorganized company is enlarging both plant and equipment. New machinery, tools and dies already have been installed, and important improvements and perfections in production processes have been made. With increased production and a better product in view, there has been a complete rerouting of the manufacturing processes, and this is said to show greatly increased efficiency already. When the expansion measures now in progress are completed, capacity will be more than doubled.

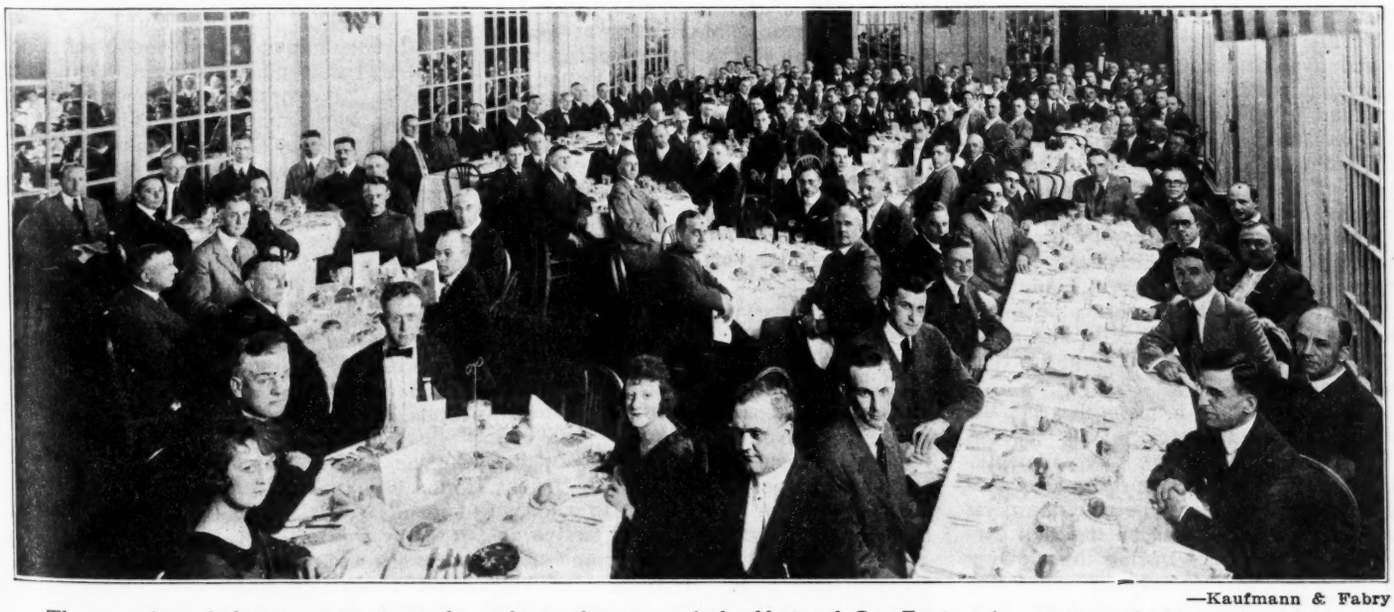
PHILADELPHIA BEHIND ON CARS

Philadelphia, Pa., June 7—Orders for passenger cars have been coming in so rapidly to dealers and distributers in this territory as to further embarrass some companies which are now far behind on deliveries and cannot see their way clear to catching up for months.

Take the case of the Ford Motor Co., at Broad and Lehigh, which produces at the factory branch here no less than 175 cars a day. Orders for closed cars, Louis Block, manager, said to-day, cannot be fully caught up with for nearly two years at the present production rate and the company is two months behind on filling orders for touring cars.

Other dealers are from one to two months behind on orders for closed cars, roadsters and runabouts. The sale of trucks continues quiet, generally.

The Philadelphia Garage Association is showing considerable activity in both business and social matters. At its latest



—Kaufmann & Fabry

The new farm lighting section is at the right in this view of the National Gas Engine Association which met in Chicago

The Wheat tractor which has started on a transcontinental trip

meeting a committee was appointed to arrange for a tour and outing at a resort near Reading, Pa., early in July. Members of allied trades will be guests.

The garagemen have adopted a resolution to adopt a form of release which shall operate as an agreement between customers and garage owners that in case of theft of cars or parts left in charge of members, the members shall not be held responsible, except that in case of the payment of a special rate, which will permit insurance against theft, the insurance money will be regularly paid.

The association of garagemen also is establishing a bureau of information with regard to reliability of employees, the system of information to be free to members, who are expected to exchange reports which may be of value. This, it is believed, will add to the efficiency of the garagemen's service.

TRACTOR TRIALS IN ENGLAND

London, May 22—Tractor trials will be held at Lincoln, England, this September by the Society of Motor Manufacturers & Traders, Ltd., the national automotive organization of Great Britain. Thorough tests of the machine will be included in the demonstration. On the first day there will be plowing in heavy soil from 10 a. m. to 5 p. m. with an hour off for lunch. The second day plowing will be in light soil, and the third day there will 2 hr. plowing in the morning and 3 hr. cultivating in the afternoon. A drawbar dynamometer test will be held before the plowing to ascertain the pulling capacity and guide the entrants as to how many plows they can handle.

The total gear ratio on each gear, the driving wheel diameter in the case of wheeled vehicles or the pitch diameter and pitch of the track sprockets in case of a track or creeper type machine must be declared and marked on the sign carried on the tractor. During the plowing an observer will accompany each machine and report on everything connected with its work.

At the end of each day the tractors will be parked but no repairs, renewals or adjustments will be made on them during the night, except by special arrangement with the judges. Any necessary adjustments must be made during the period of 1 hr. immediately previous to the start of work in the morning.

Entries may be made by the British importer or the American manufacturer. Many entries have already been received and over fifty different makes are expected.

TRACTOR TO CROSS CONTINENT

New York, June 7—A rather unusual transcontinental tour, to say the least, started from this city when a Wheat tractor began an overland trip to Los Angeles, Cal., to demonstrate that a farm tractor can be used on the road also when properly equipped.

The machine is fitted with road wheels and solid tires. Attached to it is a trailer which carries a three-bottom plow and a set of wide-cleated tractor wheels for use in plowing and other farm work. The tractor will stop at the national tractor demonstration at Wichita on its way to the Pacific coast. A crew of former Army men will pilot the tractor in shifts.

Taking Truck to Farmer

Caravan Will Tour Six States on Two-Month Expedition

CHICAGO, June 9—Plans are under way for what is probably the most extensive demonstration of the truck to the farmer ever undertaken. The plan is to start from Chicago in July with a caravan of some forty or fifty trucks, all designed for farm use. In addition to these there will be ten or twelve accessory trucks, showing tires and other truck accessories. It is not unlikely that there will be close to seventy-five vehicles all told.

The intinerary is being worked out and will cover Iowa, Missouri, Illinois, Wisconsin, Minnesota, North and South Dakota. Approximately two months will be devoted to the trip. Advance publicity men will be sent out and the tour staged like a circus. The purpose is to confine the tour to small town dealers and farmers exclusively. The object is not so much to make dealers as it is to convince the farmer that the truck has come to his assistance as a hauling proposition.

Plans for the tour are being worked out by J. E. Tracy of the Sterling Motor Truck Co., Milwaukee, and W. G. Rightman of the Winther Motor Truck Co., Kenosha, Wis.

TRUCK EXPEDITION IS OFF

St. Louis, Mo., June 9—Forty-five trucks, comprising the St. Louis motor truck expedition, left here at 6 o'clock this morning in a five-day tour of 375 miles through northern Missouri and western Illinois. The purpose of the expedition, as stated in literature, which will be dropped from a Curtiss airplane from the hangars of the Service Motor Truck Corp., is to demonstrate to the people along the route and the whole world that the "motor truck is a practical, useful, convenient and economical vehicle for the farmer and the merchant in the smaller town, that it will go and come and carry on your roads as well as on city streets."

The expedition expects to return to St. Louis Friday night or Saturday morning. The educational features include the showing en route of motion pictures on the benefits of good roads to the motorists, endurance runs, etc. Short talks on the possibilities of trucks will be made by a speakers' committee. Robert E. Lee is commander-in-chief of the expedition, and Preston W. Duffy, trainmaster in charge of movement and drivers.

MICHIGAN PUBLICITY TOUR

Grand Rapids, Mich., June 7—A western Michigan publicity tour over the West Michigan pike on the Mackinaw trail will take place the week beginning July 7. At a preliminary meeting committees were appointed to arrange for the event. The West Michigan Pike Association and the Mackinaw Trail Association will co-operate. Ten cars will start from Grand Rapids, carrying representatives of various interests in Grand Rapids, including association of commerce, the newspapers, the wholesalers, retail merchants, manufacturers, bankers and dealers. Other communities of western Michigan will be invited to send along cars. By the time the tour ends, Wednesday, July 9, it is expected that the caravan will number fifty cars.

The East Michigan Pike Association also is planning to start its annual tour out of Detroit July 6, going to Mackinaw City by way of Flint, Saginaw, Bay City, Alpena and Cheboygan. The tourists will reach Mackinaw City Wednesday evening and join the West Michigan tourists there.

Rules for Wichita Demonstration

Regulations That Will Govern Exhibits and Tests at National Tractor Event July 14-19

THE Tractor & Thresher Department of the National Implement & Vehicle Association has advanced the date of the National Tractor Demonstration at Wichita, Kan., to the week of July 14, instead of the week of July 21, as stated last week. The physical conditions of the land chosen for the site of the demonstration warrants the advancement of one week.

Entry blanks and demonstration rules have been completed and will be distributed to the manufacturers from the offices of the association at Chicago. It has been announced that all applications for entry should be made direct to H. B. Dinneen, secretary of the Tractor Demonstration Committee, at Moline, Ill. Other matters affecting the plans for the demonstration should be directed to A. E. Hildebrand, Bloomington, Ill., superintendent of the demonstration.

The regional demonstration at Denver is on this week, as is reported elsewhere in this issue. The regional demonstration at Aberdeen, S. D., probably will be held the week of Aug. 18-23.

The tractor demonstration committee has re-affirmed its previous decision not to recommend any more regional demonstrations, or consider applications for any regional demonstration, for the remainder of the year.

1—Public demonstrations shall begin at 1 o'clock and end at 3, unless other hours are announced by the national demonstration committee at least 24 hr. before starting time. Private demonstrations may be held in the forenoon from 8 to 11:30 o'clock.

2—No exhibitor will be allowed more than one tractor of each size and type on the field during the public demonstrations doing the same kind of work. He may have one or more machines performing different operations, namely: one plowing, one disking, one seeding, etc. Thursday morning from 9 to 11:30 will be devoted to seedbed preparation, seeding and cultivating.

3—Size of land for each tractor exhibitor for plowing demonstrations will be determined by the number of plow bottoms pulled, the width of plows and the highest plowing speed of tractor as given in entry blank. Each tractor exhibitor must plow out dead furrow to its left.

4—All exhibitors will be allotted land in the same field or adjoining field during each day's demonstration. Land for private demonstrations will be provided daily in one field or adjoining fields.

5—All plows on any given gang must be set at the same depth and kept there during the day's demonstration. This depth will be announced daily by general manager. Plows found operating otherwise will be ordered from the field for the balance of the day's work.

6—In all public demonstrations, the motor or tractor must not be run at more than 10 per cent above the highest speed of each as indicated in the entry.

7—Positions on field for each day will be arranged by lot in the following manner:

Separate drawings for each day's demonstration will take place at 10:00 a. m. Monday, the opening day of the demonstration. The drawings will be made from serial numbers representing total number of exhibitors.

Position on field for each public demonstration will be according to numbers, 1, 2, 3, 4, etc., as indicated by the drawing for that day.

The lowest number of land in each field shall be at point in field nearest general headquarters provided each exhibitor shall have all his land together.

Exhibitors who do not have representative at drawing will be represented by the general manager or someone appointed by him.

Each exhibitor will be required to finish his land daily in a workmanlike manner and assist in plowing the end lands as directed by the general manager.

To Test Plowing Fields

8—Each field plowed will be surveyed and staked ready for afternoon demonstrations. These fields will be tested for the drawbar pull of a 14-in. plow, plowing at the depth specified previous to the demonstration. All manufacturers will be furnished information relative to drawbar pull so they can better determine the number of plows to use on each gang.

9—Each tractor shall bear a placard to be furnished by exhibitor, showing the brake horsepower of engine, the revolutions per minute, the plowing speed in miles per hour and the kind of fuel used and its Baume test. Tractors using more than 5 per cent of gasoline shall be classed as burning gasoline and be so placarded.

10—All tractors on the demonstration field belonging to one exhibitor must be kept on or along the land allotted him for that day's demonstration until the hour designated by management for returning to headquarters.

11—No machine will be allowed to operate with special equipment other than that designed for practical use with same. No spectacular methods will be permitted on the part of salesmen or others to attract crowds. The demonstration must speak for itself.

12—Each tractor exhibitor will have the privilege of burning any kind of fuel he desires, but no one will be permitted to burn fuel of a higher gravity test than that used by his competitor burning the same kind of fuel. All exhibitors will be required to obtain fuel from one source, such to be designated by general manager.

13—No time will be required of exhibitors to make moving pictures or group photographs for commercial purposes. Manufacturers can arrange to get photographs during the demonstration if they desire. Any manufacturer or representative of farm or trade papers or news agencies will be allowed to have their official photographer on the grounds to get pictures for their own use.

14—Manufacturers will be privileged to exhibit not more than one of a kind of belt-driven machines in connection with their exhibition.

15—The interpretation and enforcing of these rules shall be left to the national tractor farming demonstration committee and its general manager.

16—Each company exhibiting at these demonstrations shall appoint one manager who will be expected to report to the general manager not later than 8 o'clock each morning for instructions and information regarding the day's work. This manager of exhibits will be held accountable for the work of his company, and no instructions will be issued to anyone else, nor will requests, instructions or complaints be recognized from anyone but this exhibit manager. He shall wear a badge furnished him, specifying his being official exhibit manager.

Exhibitor Must Keep Space in Order

17—Each exhibitor will be expected to keep plows, tractors, etc., around his tent arranged in first class order and the land allotted him for exhibiting purposes free from circulars, rubbish, etc., such as will be distributed around headquarters daily. They also will be expected to use care at all times in operating machinery with respect to its safety for all visitors. The management will appreciate co-operation of these exhibit managers in all matters.

18—Each entrant will sign the rules and thereby agree to live up to the rules and co-operate with the committee in every way to make the tractor demonstration a success.

19—The field manager shall have authority to order from the field any machine whose operator does not comply with the rules, and, further, any exhibitor who is manifestly disregarding the rules will not have land laid out or furnished for him on the succeeding days or until such time as he has met the condition.

20—No exhibitor joining the national demonstration will be permitted to exhibit until he has given correctly the price that he is in position to furnish tractors at regular production, the correct weight of tractors and all data pertaining to their construction and rating, minimum and maximum, speed at which the motors are to run, the committee to have the right to have any such machines placed under test to prove the correctness of the data that is furnished.

21—No exhibitor shall have more than twenty-five tractors of all types and kinds on the demonstration grounds.

Each exhibitor who is a member of the National Implement & Vehicle Association shall pay $100 entry fee to participate in the National Tractor Farming Demonstration for 1919, and each nonmember shall pay $200 entry fee for the same privilege. Remittance shall accompany entry application. Entry fees are to be used for defraying the expenses of the demonstration.

News of the Week in Industry

Dealer Seeks to Break Overland Strike to Get Cars

CHICAGO, June 9—News of the industry shows much activity this week. A summary of the situation is about as follows:

The United States District Court has issued a temporary restraining order, effective for ten days, enjoining local union men and other individuals from interfering with Willys-Overland workers as they enter or leave the plant or at their homes in Toledo. This decision was rendered in the suit of the Dail-Overland Co. versus Willys-Overland. The Dail-Overland Co. is a Georgia agency, and it has gone to court to force Willys-Overland to re-open its plant to fulfill a contract to furnish the plaintiff with cars.

The court will not pass on the application for such an order at this time but has directed its decision at the strikers, and a recurrence of violence will bring union officials and individuals involved in future rioting under United States jurisdiction upon contempt of court charges. Willys-Overland is preparing to resume operations at once. Meanwhile the situation is tense and Toledo awaits the outcome with some misgivings.

One hundred and twenty-five salesmen of the Champion Spark Plug are gathering in Toledo for their semi-annual convention this week. According to Sales Manager F. B. Caswell, the convention will be the largest and most interesting ever held by the Toledo firm.

Maxwell-Chalmers to Build

The Maxwell-Chalmers Corp. is preparing to build a $10,000,000 manufacturing plant at once. The plant, when in operation, will employ between 15,000 and 20,000 men and will have a capacity of approximately 500 cars a day. The capacity of the present plant is 100 cars. Work on the new plant already has started.

The car and truck are keeping Detroit from walking to-day, for not a streetcar has been running since four o'clock Sunday morning. Motormen and conductors went on a strike which not only affects Detroit but Port Huron, Flint, Ann Arbor, Pontiac and Jackson.

It would seem as if such a strike would paralyze industrial Detroit, but that is not the situation here. Thousands of cars and trucks have solved the problem. The streets are literally jammed with cars and trucks crowded with workers. The police have thrown parking and traffic regulations into the discard and are striving to keep some semblance of order in the business district. Police say motor traffic is four times normal.

Work is to start at once on the first three units of the factory to be built at Port Huron by C. Harold Wills and John R. Lee, former Ford executives. The three units will each have a length of 1000 ft. Construction work will be pushed on a huge scale and it is hoped to have a complete plant in production before fall.

It is expected that the new organization will announce the design of its proposed car within the next sixty days. Rumors state that the machine will sell at between $1,200 and $2,000 and will be a light six-cylinder high-quality car, embodying new features in body and motor design which will create a sensation in automotive circles. Mr. Wills said in Port Huron last week that he had been working on the car for several years and that experimental machines have been driven as high as 180,000 miles without serious wear.

It is said many of the ideas of the Hispana-Suiza car have been worked out and perfected by Mr. Wills and that he controls many of the American patents on the French machine. It has been said that the new Wills engine, while a six-cylinder, is so light that one man can almost carry it.

The gigantic nature on which the new firm proposes to build is typical of the Ford way of doing things. To put up the plant as outlined will require a great many million dollars but the success of both Wills and Lee as motor car manufacturers is sufficient to give them access to an almost unlimited amount of capital.

While they may not be built at present, the new factory plans call for ore docks, smelters and foundries. The river is nearly 40 ft. deep at this point, permitting heavily loaded ore boats to come alongside the new plant. The new concern ultimately plans to manufacture everything going into the construction of the car with the possible exception of tires and a few patented accessories.

Port Huron is a city of 40,000. It is said the new Wills enterprise calls for the employment of between 15,000 and 25,000 men and the city has commenced to plan for a growth of 100,000 within two years.

With the motor car makers rushing their output as fast as possible and with millions being invested in tools, machines and other production equipment, the parts makers also are expanding. The truck industry is going strong, with the light truck gaining in popularity and the volume of its sales. The tractor field, still somewhat stagnant, is showing unmistakable signs of renewed life. New companies are entering this field and are equipping plants to manufacture on big scale.

The machinery men are recovering from the fright given them when it became rumored that the War Department was very likely to place its millions of dollars' worth of war machinery on sale. So far this Government machinery lies idle and the Government is promising not to sell it unless new machines are purchased of the machinery men for every machine sold by the Government.

Machinery makers expect business to reach its pre-war level by August. The attitude of watchful waiting no longer exists. The prices are nearly stabilized. If there should be further reductions, they will be very slight and insignificant. Further price drops cannot be expected because the demand for raw materials as well as finished products in building tools and machinery has not diminished and will not for months to come.

Various Productions

The Acason Truck Co. is running full production and is turning out from twenty to twenty-three jobs a day.

The Hinkley Motors Corp., after shifting back from a 100 per cent war rating to a peace basis, got into production June 1 and is running approximately five engines daily. Owing to the delay, the company does not hope to run more than 6000 engines this year but anticipates running 15,000 in 1920. About 350 men are employed, but this number will be increased before the end of the month.

The Northway Motors Corp., one of the units of the General Motors, is getting into heavy production and is averaging 580 car engines daily. The company also is making engines for the Samson tractor, but only a few. Approximately 400 engines are being turned out daily for Oakland, 150 for Olds and thirty for Cole. It will be nearly a year before the building program recently outlined for this company goes into effect.

Denver Event Biggest of Kind

Tractor Demonstration Promises to Be Epochal

DENVER, Col., June 9—Special telegram—The mountain states national tractor demonstration opened to-day promises to be the biggest event of its kind in the history of power farming. More than $3,000,000 worth of machinery is on field where more than 100 tractors tomorrow morning start plowing 2700 acres virgin prairie soil. To-day was given over to turning up. Plowing, disking and harrowing will be done Tuesday, Wednesday and Thursday.

More than 300,000 persons are expected. Colorado now has 4000 tractors. Officials say the demonstration will sell 75,000 in the next five years. The field is in excellent condition. The spectacle of 300 plows in the field at one time never before was seen. Turning 1 acre into seedbed every 5 min. promises epochal event in American agriculture. A monster ordnance exhibit is a feature. The Denver Tractor Club has arranged many social events.

Michigan to Regulate All Drivers in State

New Law Requires That Applicant Demonstrate Ability to Operate Car

LANSING, Mich., June 6—Michigan motor car clubs scored a distinct triumph when Governor Albert E. Sleeper signed the James license bill. As a result there has been written on the law books of this state a statute which gets right at the fellow who disregards the rights and lives of others. It provides for the registration of every driver in the state. The secretary of state is paid the nominal fee of 50 cents to cover the cost of registration. Once a driver is registered his license is permanent unless he runs afoul of the law.

Drastic but Just

The James law is a drastic one, but nevertheless it is just. During its passage through the House and Senate it met considerable opposition and even after it had been approved by both lawmaking bodies, the situation reached the point where the governor was considering placing his official veto on the bill. The Detroit Automobile Club, however, fought for its passage.

The law provides that every applicant for a license must give his name, postoffice address and place of residence. Applicant must state whether he has any physical defects which might affect the operation of a motor car and whether the applicant has been convicted of violating state motor car laws.

The application is forwarded to the secretary of state, but before that it must be approved by the chief of police of the city in which the applicant resides or, if applicant resides in the country, it must be endorsed by the sheriff or one of his deputies. Police chiefs and deputies must personally examine each applicant either by an oral examination or a practical demonstration to ascertain such person's ability to properly operate a motor vehicle and the examination also must include questions touching upon the applicant's knowledge of the motor vehicle laws of the state.

When the applicant demonstrates to the satisfaction of the examiner that he is qualified to operate a motor vehicle, the examiner must approve the application and it is then filed with the secretary of state. No license must be issued without the approval of the local examiner, provided, however, that the applicant may appeal to the secretary of state from the decree of any local examiner.

What License Must State

The secretary of state is required to assign a distinguishing number to each license. Each license must state name, age, place of residence, postoffice address, address of licensee, number assigned to him or her, brief description of the licensee for identification and such other facts as the secretary of state may determine.

The license card under the requirements of the James Bill, will resemble a passport issued by the federal department of state and should the Michigan department carry out the Federal idea, each card will bear a miniature photograph of the license holder. Such licenses must be carried at all times when a person is operating a machine on the public highway and must be presented upon demand by any officer of the law.

Within sixty days after the act takes effect the secretary of state must furnish every sheriff and police chief with a complete and accurate list of all licenses issued, with the names of the licensees, their addresses and numbers assigned to each. Non-residents are not required to obtain these licenses during the period they are permitted to operate under Michigan laws, and it does not apply to regularly licensed chauffeurs.

Authority is given the secretary of state to suspend, for not more than one year, the license issued to any person convicted of reckless driving, of driving while intoxicated or having caused injury to any person or damage to any property and who leaves the scene of accident without leaving his name and address.

After a hearing the secretary of state may order delivered to him the license of any person when it is established that the holder by reason of physical or mental defects is an improper person to operate a motor vehicle and the license shall not be returned except upon petition of the holder and following an investigation which satisfies the secretary of state that the person in question is capable of operating a car.

Provision is made that no license may be suspended by the secretary of state except after a hearing and, where the licensee is a resident of a city, except upon written complaint of the chief of police, approved by the mayor. Where the licensee is the resident of a village or township the complaint must be signed by the sheriff or his deputies and approved by the supervisor of the township.

Violation a Misdemeanor

Any person operating a motor vehicle without the required license is deemed guilty of a misdemeanor and upon conviction may be punished by a fine not exceeding $100 or by imprisonment in the county jail not to exceed three months or by both fine and imprisonment in the discretion of the court.

Secretary of State Vaughan, who has charge of the administration of the law, is wondering where he will get sufficient clerical assistance to put it into operation. The budget bill limits his department to 100 clerks, and it is conservatively estimated that forty additional clerks and stenographers will be required in the state department to successfully adminster the proposed law.

There are now approximately 300,000 licensed cars in Michigan and it is estimated that aside from the regular chauffeurs on an average three drivers' licenses are issued for every car. Next year this will mean approximately 1,000,000 licenses.

150,000 FORDSONS THIS YEAR

Dearborn, Mich., June 6—Henry Ford & Son will produce approximately 150,000 tractors during the fiscal year commencing June 1, 1919, it is estimated. The plant has been in operation 14 months and May 1, the date it closed down for inventory it had made 53,078 tractors. Inventory work was completed June 1, and the company is now back in production. Approximately 100 tractors were run daily this week, and before the middle of June the daily output will hit between 300 and 400 machines.

Orders have been received from France, England and Belgium for 1,000 tractors. The west is demanding thousands of machines, and business in the eastern states is becoming unusually active. Tractor dealers in Texas, Oklahoma, Kansas, Minnesota and the Dakotas have sold out, while New York, Pennsylvania, Illinois, Indiana and Ohio are demanding tractors.

VIM TRACTOR IS PLANNED

Milwaukee, Wis., June 6—The Vim Tractor Co., has been organized to take over the plant and equipment of the Standard Machinery Co., Schleisingerville, Wis., manufacturer of gas and kerosene engines, which recently has developed a tractor design to be placed in quantity production by the new corporation. The Standard works are manufacturing tractors by May 15.

TO STANDARDIZE ARMY TRACTORS

Detroit, June 6—The Government has established an experimental station for artillery tractors. Don Ferguson, consulting engineer, is in charge. Associated with Mr. Ferguson at the station is William H. Oliver, former chief engineer at the Hyatt Roller Bearing Co. The station will devote its efforts to standardizing the Army tractor. There is a large corps of regular Army men, enlisted men and civilians.

AIR SHOW FOR HOLLAND

Washington, June 6—During July and August an International Aeronautical Exposition will be held at Amsterdam, Holland, under the auspices of the chambers of commerce of Amsterdam and Rotterdam, the secretaries of the interior, war, agriculture, commerce, waterworks and the governor of the province of North Holland and the chairman of the Royal Dutch Association of Aircraft. Foreign airplane industries will take part.

The place of business of the Motor Car Service Co., another concern which has made good

Knowledge of Car Spelled Success

Skill Plus Methods Raised Small Tenant to $75,000 Business

IN the Motor Car Service Co., Chicago, one finds the electrical service problem solved completely. Parts for any motor car electrical equipment made are on hand except in extremely rare cases, and then there is on hand sufficient machinery to make the part. All electrical repairing is guaranteed to give service for one year. This thoroughness is the keynote to the success of the company, organized in 1914, starting with a rented stall in a private garage, and to-day representing about $75,000 housed in two buildings, one on Chicago's north side and the other on the south side. The station on the south side is the parent and principal station. The other one was established for the convenience of the customers living at the other end of the city.

Worked Four Years for Nothing

Max Weber is the figure in our story. He is the Motor Car Service Co. Mr. Weber is a graduate electrical engineer from one of Europe's famous technical institutes. After he was graduated, with a degree, he paid $60 to secure his first "position," which paid him nothing for the first four years of his work. This time was spent with the European Bosch organization, and it was here that Mr. Weber learned the motor car electrical business. During the time spent as an apprentice he made magnetos from the ground floor and up, designing and building them.

It is this thorough knowledge that makes the Motor Car Service Co.'s service so valuable. Mr. Weber has thirty-five skilled mechanics working for him now, and each of the thirty-five men is an electrical expert. The men are paid $45 to $50 a week, and some more. There are two men whose business it is to repair magnetos. These men are both experts, one of them being the designer of a famous magneto. There are other men who work on starters and some who work on generators. There is a complete ignition staff. All these men are under the direct supervision of Mr. Weber. He is the chief diagnostician of the company. He looks over every car that comes into his station on the south side, decides what is wrong with it and then turns it over to the men equipped to fix it.

In addition to the work which comes from the owner, the company receives a considerable volume of business from outside dealers who are not equipped to handle the electrical equipment of the motor car. This part of the business is growing daily. With the highly specialized staff and the equipment for repair, Mr. Weber is able to repair magnetos, generators, starters and any electrical apparatus rapidly and accurately.

The apparatus is put through complete tests after it is repaired. If it is a magneto, it is set on a stand and turned over at variable speeds through automatically controlled shafts, for as much as 24 hr. if something else develops to make the test be of that duration. The speed variation during the test is more than will be met in the car. The windings are tested for grounds, and insulation tests are made. On the whole, when the magneto is pronounced ready, it might be said that everything, including the pedigree of the instrument, has been gone over.

A much distressed owner brought his car in. He had been having trouble with the Bendix starter on the starting motor. The man never drove his car fast enough to keep the battery fully charged and consequently experienced trouble with the Bendix starter not meshing with the teeth on the flywheel. If the generator was adjusted to charge enough at these slow speeds, it is more than probable that at an occasional burst of high speed the battery would be overcharged and injured. Max Weber designed a solenoid that helped pull the Bendix drive into mesh, by utilizing the starting current of the motor.

There are many cases of special cases like this. Another case where knowledge of the business enabled an intricate piece of electrical equipment to be made is cited. A constant-voltage direct-current generator, to replace the alternating current magneto on the Ford, was made. This was an expensive job, but the customer wanted it and Max Weber knew how to make it, so all were satisfied.

How Repairs Go Through

It is the outside business that Mr. Weber is building up. Parts coming into the shop one day are repaired the same day, tested the next day and then sent out. Or, if the repair is not of a rebuilding nature, very often the work will go out the same day.

This reputation has been built up without advertising. The only publicity gained has come from satisfied customers telling their friends about the work. They have also told outside dealers about Max Weber's service and those not similarly equipped have sent work in to be repaired. When the part comes back in two days thoroughly repaired, the dealer's reputation for giving service has been strengthened with his customers, and Mr. Weber's reputation has been strengthened with the dealer. This dealer tells other dealers, and so it goes. Mr. Weber's reputation for service has been built up by word of mouth only, and now as a result of this his daily business in the south side shop amounts

to about $750 a day. All of this is not from work sent in from the outside, for the company handles about seventy-five cars a day in addition.

This high grade service is fast making friends among the manufacturers, for the company now officially represents several electrical equipment makers. It is very interesting to note that with all the different makes of electrical equipment and every make of car having a different plan of wiring, one cannot find in the place a wiring diagram. Mr. Weber says that all systems must adhere to one principle or other, and when his men know all the principles it is not necessary to spend time looking at a diagram.

Much Special Equipment

In the line of special equipment, the place is a veritable storehouse. The variable speed control which functions automatically and operates the test line shaft at variable speeds without attention is very ingenious. Its operation takes advantage of the fact that putting resistance in series with the armature of a shunt motor slows it down and when in series with the field increases the speed. The control hand of the automatic switch is driven through a worm attached to the line shaft. The drive is with a round belt on a grooved pulley. As the hand of the switch revolves it cuts out the resistance in series with the armature and thus allows the motor to speed up. When the hand has moved up to its normal position the motor is running without resistance in series with it all. But as the hand moves farther it cuts in resistance in series with the field. This speeds up the motor at a constantly increasing speed until the hand has moved around to the armature contacts, and it then slows down only to build up again.

Apparatus like this is hard to buy but is not so hard to make if one has some machinery to work with. In Max Weber's service station there is a lot of special equipment of this kind, built by Mr. Weber. This machinery is used to remedy difficulties after the expert analysis is made.

Biggest Jobber Meeting

Hot Springs Gathering Proves Most Important Ever Held by Organization

Will Start Post-War Operations with Clean Slate

HOT SPRINGS, Va., June 7—The Automotive Equipment Association, which the trade colloquially knows as the jobbers' association, has concluded the biggest and most important meeting it ever held. Nearly 600 persons attended, including the wives and children of many members. Some companies were represented by several men.

The association laid plans for bigger work than it has ever done. Having successfully passed through the Sherman law litigation and being desirous of sweeping the deck clear of all details connected therewith, it was voted to rescind all the regulations, by-laws and constitution and draft a complete new set. The association starts with a clean slate for its after-the-war operations.

Membership Re-adjusted

There was also a re-adjustment of membership. Since the association was formed four years ago there have been few resignations and there have been constant additions to the membership. Even when the Sherman law suit was brought the membership continued to increase. However, at this time there were thirty-two withdrawals from the association. The reasons vary all the way from 'too expensive" to "not doing enough jobbing business to justify membership." There were about a dozen different reasons. These withdrawals leave the membership more solid than before. It has made very little difference in the total membership because twenty-two new ones were added and there is a lengthy waiting list yet to be acted upon by the membership committee.

The principal activity of the organization in the near future will be its business exhibit and convention in Chicago Nov. 3-8 in Medinah Temple. This exhibit was planned for last October but was called off because of the war. Participation in the exhibit will be limited to manufacturers who are members of the A. E. A., but all jobbers, whether members or not, will be admitted to the exhibition.

The convention began Monday with committee meetings Monday and Tuesday. The general sessions were held Wednesday and Thursday. A session was scheduled for Friday, but it rained Thursday afternoon so the whole day was given to business and the convention ended Thursday afternoon.

There were many amusements—cards, tennis and golf mostly. The golf tournament was run Friday with over fifty entries.

What They Discussed

Wednesday morning was devoted to preliminary business and not much of importance transpired. Wednesday afternoon the manufacturers met in the Casino and the jobbers in the Homestead ballroom for the discussion of problems related to those two lines. The manufacturers discussed labor troubles, and the jobbers talked about trade matters.

Thursday both manufacturers and jobbers met in general session. Harry F. Atwood, author of "Back to the Republic," stirred the convention with a talk on the need for cool-headed action in these disturbed times and a return to the principles of the constitution of the United States. Robert W. Martland, secretary of the California Automobile Trade Association, aroused enthusiasm for local and state association work with a story of what has been done in California.

The committee on standardization recommended better labeling and outlined some of the plans it intends to work out.

ELCAR INCREASES PRICES

Chicago, June 9—The price of the Elcar six-cylinder has been raised from $1,375 to $1,475. The four-cylinder remains the same, $1,175.

Two views from the place of business of the Motor Car Service Co., the waiting room at the left and the office at right

REPAIR SHOP DAILY REPORT

Customer J. Doe R.O. 4895

Model 3-25 Estimate $15.00

Date	Hours	Amount	Aut. Mat. List	TOTAL
9/23	1½	1 88		1 88
24	5½	6 88		8 76
25			1 35	10 11

NO CHARGE

Form 106. 2500. 9-19.

Daily repairshop form used by distributer

Estimate Basis for Repairs

Method Anticipates Complaints—Satisfies Customers —Increases Production

By Harlan C. Skinner
Motor Age Editorial Staff

MOTOR car service ought to be a cash business transaction. It should be handled on a repair estimate basis for the best results. These are well known facts established by the experience of distributers and dealers who maintain large repairshops. Practically all business institutions are prepared to give an accurate estimate on work which they propose to do. This applies equally well to an automotive repairshop. They should have sufficient data on the time required to do repair work to enable them to estimate very closely the cost of doing any class of repair work.

Factory Statistics for Repairs

Some factories provide their distributers and dealers with average time statistics for repair work. These values vary slightly for different shops, depending on the mechanical equipment and the class of labor available. These data are important, as they furnish a sound basis for comparison between shop methods of a factory repair station and that of a distributer. It furnishes an incentive for the distributer's repair department. It enables him to keep an accurate check on the work of this department and, in nearly all cases where this system is employed, has resulted in a considerable reduction of the time required to do repair work. This results in a lower maintenance cost for the car owner and in increasing the amount of repair work a certain shop is capable of.

If the time requirements for repair work are not available for a certain shop and a certain make of car, it can be secured during the ordinary course of business. Select a competent man who is familiar with the shop methods used, preferably the one who has charge of the service floor in the repair station. Let him estimate every job that comes in for work without telling the customer that he has done so. This estimate should specify the number of hours and the material needed. It should be impressed upon the shop that they should try to live up to the estimate. All will not go well for the first few weeks. There will be many estimates that will be too high and too low. Conferences between the service superintendent and the repair superintendent will be necessary so that they can adjust their differences and arrive at fixed standards for the various types of repair jobs.

During the experimental period a close study should be made of all repair orders. Each job as represented by the customer's invoice should be checked against the estimate. If the total estimate is too low, find out why. If the material estimate is too low, the service superintendent may not have examined the car closely enough at the time the car was received by him and guessed at the material needed instead of getting down to facts. Or the time required to do the job may be too high, due to some workman loafing on the job. It may be a combination of these. In either case it soon will show you the loopholes in your shop. This analysis will enable the service department heads to get the system down to a working basis. It will enable the shop superintendent to know his men, to determine who is fast and who is slow. It will enable him to put the right man on the right job. And that means time saved, better efficiency, more work out of your equipment and employees—all at less cost to the customer whom you are serving.

The repairshop should have some means for keeping track of each job each day. This will require a small estimate sheet for each repair job with columns for date, labor, material and total. This will help the shop superintendent to follow up each job and to determine at any time during the day just where a certain job stands with reference to the estimate.

Do not forget that the shopman is an important person in this system. He should have good working conditions. Plenty of light, good ventilation, proper tools, clean overalls twice a week and, above all, clean floors. If you have no shop porter, get one and see how quick things brighten up among your shop employees. You will find him a profitable investment.

After this system has been tried for two or three months the management has probably found out a lot of things about its service station and the possibilities of it which they did not know before. No concern is adverse to having its service bettered, and the estimate basis is a sure road to improvement. During the development era every means should be taken to introduce and devise time-saving tools. It will be found easier to develop special tools under this plan than under the old method of letting the shop plod along as best it can, as the special conditions continually arising will be more or less suggestive.

There are ways and ways not to present an estimate to a customer. The "about $25" method, for example, has its drawbacks. It leaves a loophole in the transaction. It is not definite enough. It is likely to lead to misunderstandings and to be a bone of contention on the customer's part. That is just the thing a service station wants to avoid. Make it very definite by printing on the repair order which the customer signs the following: The cost of the above mentioned work will not exceed $25. That cinches it. It anticipates complaints about the cost of a repair job after the car is delivered. Give the customer a carbon copy of the order he has signed, stating the amount of the estimate and listing work to be done.

Give Customer Benefit of Saving

Perhaps the repairshop may be able to do the job a little cheaper than the service superintendent estimated. If so, give the customer the benefit of it. If the $25 job actually amounted to $23.50, then bill the customer $23.50 when he comes for his car. This produces satisfaction among the customers and even if the service station does run over on a few estimates during the course of a month's business, it can afford to absorb the excess.

Considerable work can be eliminated in invoicing, due to the understanding with the customer at the time the car was received in the service station. It will not be necessary to list the material used separately or to brief what work was done on the car. However, it would probably be best to make a division of the total, showing the labor and material separately in bulk. A sample invoice might read like this: As per estimate on Repair Order No. B12, Labor $11, Material $12.50, total $23.50.

The advantages of this method are manifold. It enables a service station to place its business on a cash basis in the simplest manner possible. There is no doubt in the customer's mind as to how much the job is going to cost him. He has been told before he leaves the

service station that the job will not exceed $25 and has signed a repair order to that effect.

Time estimates for the completion of a job are much more accurate under this system, as one knows the capacity of a shop. Of course, unforeseen difficulties sometime arise which prevent delivery at the proper time. In some shops this element of the business is handled by a chaser who follows up all repair jobs to see that they are completed at the proper time. In case of a delay he telephones the customer and explains the cause of it. In this connection it is important that the service superintendent secure and place the customer's telephone number on the repair order. If the customer has no telephone, the service man should instruct him to 'phone the repair station at least an hour before promised delivery and find out from the car chaser the status of his car.

When a customer comes for delivery of his car, he knows what to expect in the way of repair charges and comes prepared to meet it. Do not turn his car over to him in a dirty condition. Nothing is more disgusting to a customer than to find the steering wheel, control levers, cushions, etc., greasy.

Departmentizing a Business

Intensive Merchandising of Motors and How It Should Be Effected

By Fred M. Loomis

Motor Age Editorial Staff

"THE biggest thing in the automotive business is to get organized. Have someone at the head of every department upon whom you can place responsibility and then make them all saw wood," says E. J. Haupert, manager of the Rude Auto Co., Perry, Iowa.

When one digs into the organization of this Perry concern, which, in a town with only 5000 inhabitants, with all the restrictions the war put around the motor car man, sold a little over $200,000 of goods during 1918, one wonders which to admire the more, the man who built up the organization in the first place and who started it going, or the man who had the snap and ability to keep it going, and even to accelerate it, once it was in motion.

Efficiency of Organization

Because the Rude Auto Co., as it is today, is the expression of the genius of two men. One of these is Lloyd Edson, now the general sales manager of the whole Rude organization, with headquarters at the main office of the company at Cedar Rapids, Iowa. The other man is the present active manager—and he is some active—of the Perry branch, E. J. Haupert.

Lloyd Edson is an enthusiast on efficiency, yet withal he is very human. He likes to talk about the psychology of salesmanship and all that sort of thing, yet when it comes to actual practice, his psychology resolves itself into plain, every-day horse sense, but sense scientifically directed. His bent lies along the line of intensified merchandising and at Perry, which business he managed for a number of years, he was permitted to put his theories into actual operation. So much of the practical lay behind these theories that most of them made good, so remarkably good, in fact, that Perry Rude reached down to Perry, Iowa, picked Edson up and put him into the general office at Cedar Rapids and told him to put some of the same practical theories into effect in the other five of the Rude branches. So there he may be left for a time to work out his own salvation while this story will concern itself with the business at Perry as he left it and with what the present manager, Haupert, is doing with the legacy.

Haupert is no slouch himself. As a matter of fact he is the livest kind of wire and he is setting a pace with the Perry branch that is the admiration and the envy of all the other Rude houses. Haupert was wise enough to recognize the value of the organization Edson had built up, and proceeded to develop it. Asked to what he attributes his success in managing the business he makes answer as he was quoted at the beginning of this story.

The Rude business at Perry is one of the best examples of thorough departmentization the automotive trade of the middle west affords. The business is divided into five distinct departments, with a responsible man at the head of each. These are:

1—Sales organization. This is headed by E. J. Haupert himself, with three salesmen who devote their time to motor cars and motor trucks and one salesman who specializes on traetors and tractor equipment.

2—Accessories. Lewis Stevensen heads this department and he has two men under him.

3—Shop. A. L. Fallein is foreman of the shop and he directs the activities of nine men.

4—Service. Ted Crook, with four men, takes care of this.

5—Vulcanizing plant. This is a new experiment and it is up to Ed Volger, foreman, and his two assistants, to make good.

While not considered a distinct department, the office is in effect an organization apart, in charge of Mrs. George Stevens, with two women assistants.

This makes a pay roll of twenty-nine persons; a very considerable force for an automotive business in a town no larger than Perry.

The accounting system, without which it would be impossible to determine whether or not the plan was working efficiently and profitably, is very complete, and, to an outsider, looks complicated. Indeed, it is complicated; too much so for any automotive business less completely organized or less efficiently manned to undertake. But, as this company is organized it is entirely feasible and is wonderfully informative down to the minutest detail of the business.

Without a reproduction of the blanks and forms used it is impossible to describe the system intelligently. Suffice it to say, however, that from the records kept it is possible to tell at the close of business on any day just how the business stands; what the sales have been, not only in total, but for each individual in the organization; what these sales consisted of; what the expense of making the sales was; whether there was loss or gain on each individual sale, and how much, and so on through every department of the business. It is not too much to say, perhaps, that not one concern in a thousand has such detailed, daily records of its operations. And so perfect is the system that apparently it is kept right up to the minute with very little trouble.

The plan originally insituted by Lloyd Edson was one for intensive merchandising, as has been stated. Following the determination to departmentize and thus to concentrate endeavor along defined lines, the next problem was to find men competent to fill the positions of heads of departments who might be safely entrusted with responsibility. The special aptitudes of the men in the employ of the company were studied and men were selected as department heads whose sales records, or whose efficiency in mechanical lines, recommended them. This plan still is followed. It works out even within the individual departments. For instance:

Head for Repairshop

A. L. Fallein is foreman of the repair shop. He was selected because of his mechanical ability and because he had tact in the handling of men. Under him he has nine mechanics. In the assignment of jobs to these men he takes individual skill and specialized ability into consideration. He has one man to whom is assigned most of the work on engines. Another man is a special radiator man. Still another is an expert on ignition devices. There is a man who is particularly good on such work as winter tops, and so on. The work is given out to that man who is the most competent to do that particular job. Fallein says that by this method he gets an unusual percentage of turn over out of his shop.

Every Monday morning there is a conference of all the department heads at which matters pertaining to the conduct of the business as a whole are discussed. The purpose of these conferences is to bring all departments into harmonious relationship and to see that all are working together for the best interests of the whole business. In fact, a cardinal tenet in the creed of Manager Haupert is that every person connected with the organization owes a responsibility to the company over and above the mere fulfilling of his particular duties; that the interest of the organization is paramount to that of any department or position and that every man must co-operate with heart, head and hands.

Every morning before the salesmen start out for their daily work a conference is held at the office and the work planned for the day along lines which promise the best results.

Heating Plants for Garages

Practical Suggestions and Plans Whereby You Can Prepare for Future Cold

MOTOR AGE is receiving an increasing number of inquiries for opinions as to what is the best kind of a heating plant for a garage.

In the southern and west coast sections of the country this problem is not one that the garage man has to solve, but in our northern states and especially the northwestern it is quite serious.

There are two or three things that can be said about heating the garage which are of very great importance and still have nothing at all to do with the heating plant. Yet if these features are neglected the result may mean a loss of thousands of dollars to the owner during the life of the garage.

Distribution of Heat

First of these things and probably the most important is the distribution of the heat to the points that need it and in the right proportion. The garage or storage room proper which is the bulk of the building needs very little heat, a temperature of 45 deg. should be plenty of warmth at any time and there is no absolute need of more than 35 deg. to 38 deg., though 40 deg. would leave a safer margin so that there would be no danger of freezing in the more exposed parts near doors, etc. But while the garage may be pretty cool the office must be kept up to 68 deg. or 70 deg. and the repair shop must be kept around 60 deg., the paint shop 70 deg. and the varnish room will need as high as 80 deg.

With these varying temperatures necessary to the best results it will be seen that our radiation must be apportioned to give these results; but the part that the heating plant will not perform and which we are talking about now is the separation or isolation of these departments to such an extent that they cannot rob one another of their heat.

Everyone knows that when air becomes heated more than the surrounding air, it rises and when it comes in contact with cold surfaces it cools, becomes heavier volume for volume and settles down again. This physical law points to two things. First, the rooms in which temperature is to be maintained must have their walls extend to the roof or have ceilings that prevent the air of other departments from coming on to equalize the temperature. Fig. 1 shows how the warmer air from office and shop will circulate over the low partitions at the highest level descending only after it has been cooled by the roof to a temperature lower than that of the garage. The heated air of the garage is not so hot as that in the office and shop, consequently will not reach so high a level, but will shift laterally to take the place in the air that has left the office and shop sections. Of course it is possible to maintain temperatures even under these conditions, but it can be done only by increasing the supply enough in the office and shop to offset the flow of heat over the partition to the garage, decreasing at the same time the supply in the garage. The result will be drafty uneven heat at best.

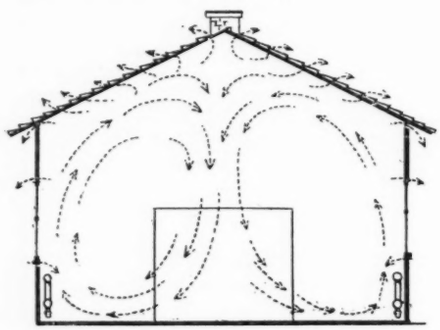


Fig. 3—The thousands of small openings, each one in itself insignificant, make up a large volume when taken together

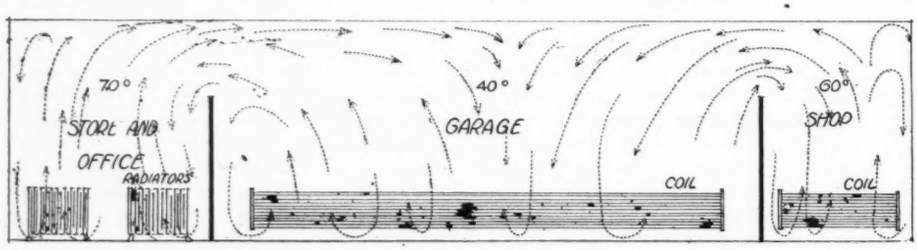


Fig. 1—This diagram is to illustrate why it is hard to heat different sections of a garage to their proper temperatures when they are not properly separated

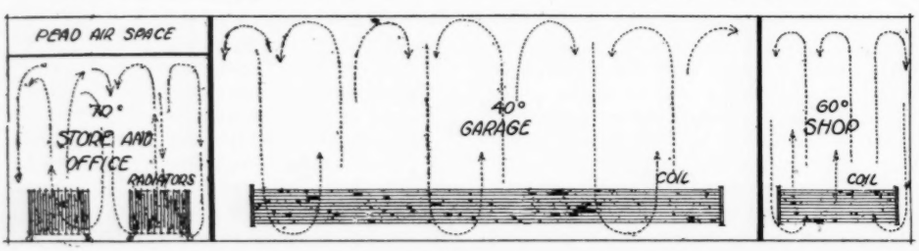


Fig. 2—No exchange of heat between departments can exist in a case like this

Fig. 2 shows the circulation of air in the same building where the partitions are complete. Second, the roof especially and all walls should be made as non-conductive as possible in order to keep the heat in the air.

Here is a table showing the relative conductivity of materials which can be used in roofs and walls.

Air	1
Wool felt	1.53
Sawdust	2.1
Soft building paper	2.7
Fire brick	4.91
Lime	5.1
Soft wood	5.26
Asbestos paper	7.54
Average vulcanized rubber	7.72
Pasteboard	7.9
Plaster of Paris	12.28
Portland cement	12.45
Sand	16.51
Glass	19.3
Hard brick	26.31
Slate	66.31
Sandstone	97.37
Steel	194.7

From this table of the relative conductivity of building materials, where dry air is taken as a unit, it is readily apparent that fire brick and lime will transmit about five times as much heat in a given time as air, and steel nearly 200 times as much.

Leaks and Heating

Another very important feature in heating the garage which has nothing to do with the plant is the matter of leaks. Mechanics are apt to be very careless in the construction of a garage. They think of the front door as being open all the time anyway and that numerous small openings are of no consequence. As a fact all the small openings act as chimneys to convey away heated air, the garage door supplying the draft. If the chimneys are all closed there would be very little cold air come in at the door. Your fire will not burn long after you put a slab of wood on top of the chimney.

Thus it will be seen that it is necessary to make all windows tight, calk around all window and door frames, see that all doors fit reasonably tight, stop all openings that may be found around the eaves where roof and side walls meet, in frame buildings. In fact, every little opening will do its share toward cutting down the efficiency of the heating plant and must be closed.

The writer once saw a house fumigated with a substance that produced a dense white smoke and was amazed to see the smoke issuing from every conceivable place, it just oozed out all over. In the winter the heated air oozes out just the same and if it were visible like the smoke, some of us would realize why our fuel burns so fast and produces so little effect.

In frame construction, building paper is very effective in stopping openings between boards and should be used very freely. It has the disadvantage, however, of becoming rotten after a few years and disintegrat-

ing. Tarred paper will probably last longer.

Having disposed of the outside influences affecting the heating plant, let us now enumerate the various types of heating that might be used.

Low-pressure steam (one-pipe and two-pipe).
High-pressure steam.
Exhaust steam.
Vacuum steam.
Vapor (an automatic vacuum).
Hot water (overhead system).
Hot water (ordinary).
Hot water (pipeless).
Hot air (natural circulation).
Hot air (forced circulation).
Hot blast (air forced through steam coils by blower).

Of the numerous types of steam heat the ordinary low-pressure is the most common. It is efficient, direct and almost fool-proof and anyone of average or even low intelligence can be taught to run one of these plants.

High-pressure steam is almost never used as in cities it requires a license for the boiler and a licensed engineer to run it.

Where steam power is used on the premises or in an adjoining or near-by building, exhaust steam is a very cheap and good means of obtaining heat. Exhaust steam is handled just the same as low-pressure steam —which it virtually is.

Vacuum steam is a later development of the low-pressure steam system whereby temperatures in the heating coils, lower than the boiling point of water are obtained. This is done by inserting a pump in the return pipe and extracting the air from the whole system. Water in the boiler can be made to boil as low as 100 deg. which is a great advantage in mild weather.

Vacuum and vapor systems are all of the two pipe variety, that is, the radiator or heating coils have a steam supply pipe and a condensation return pipe. The difference

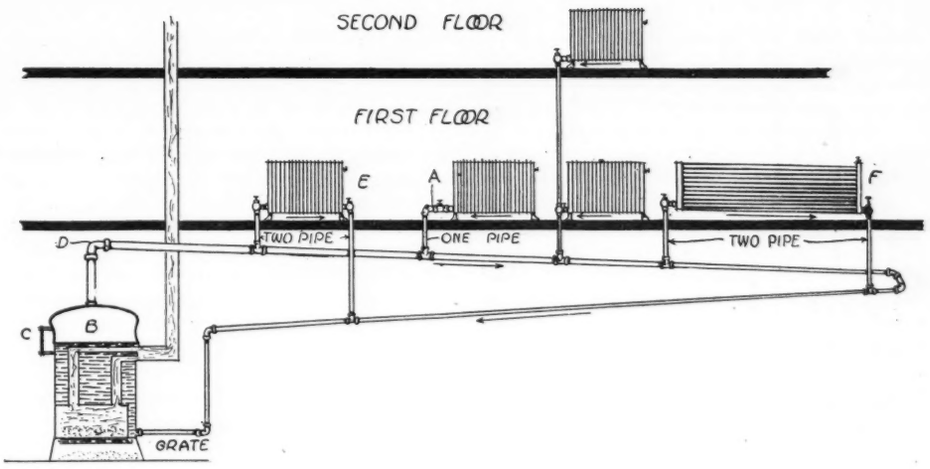


Fig. 4—On the simple low-pressure steam system all the condensation flows down in the direction of steam travel except the one-pipe risers, which should not have any long horizontal runs

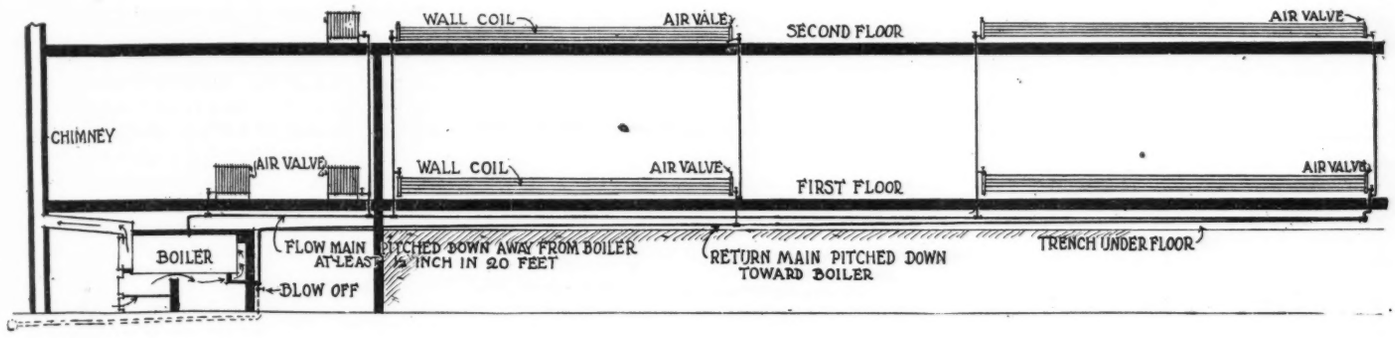


Fig. 5—The boiler is in a small basement and mains run in trenches under the garage floor

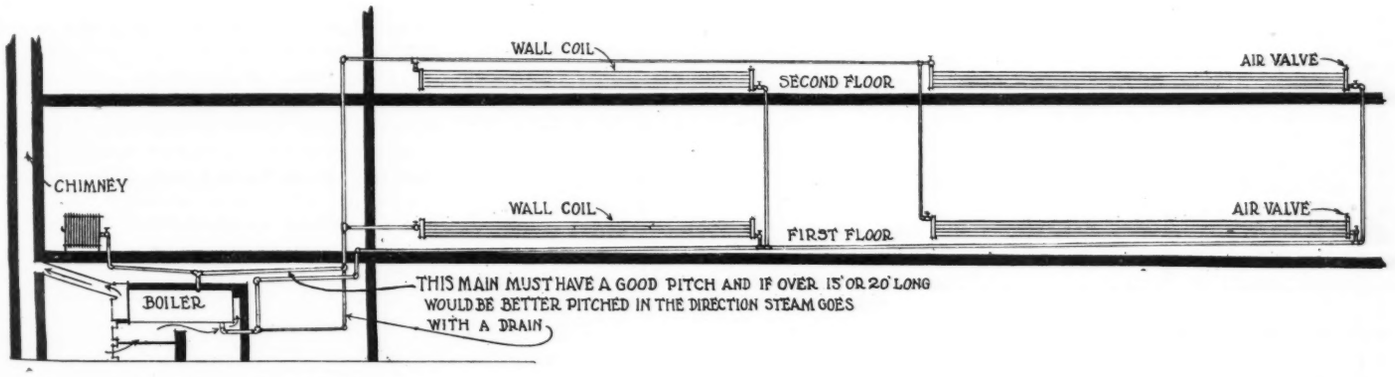

WALL COIL
SECOND FLOOR
AIR VALVE
CHIMNEY
WALL COIL
FIRST FLOOR
AIR VALVE
BOILER
THIS MAIN MUST HAVE A GOOD PITCH AND IF OVER 15' OR 20' LONG WOULD BE BETTER PITCHED IN THE DIRECTION STEAM GOES WITH A DRAIN

Fig. 6—The boiler is here in the small basement, but the mains are run above the floor. This is a good arrangement where there are no doorways to be crossed

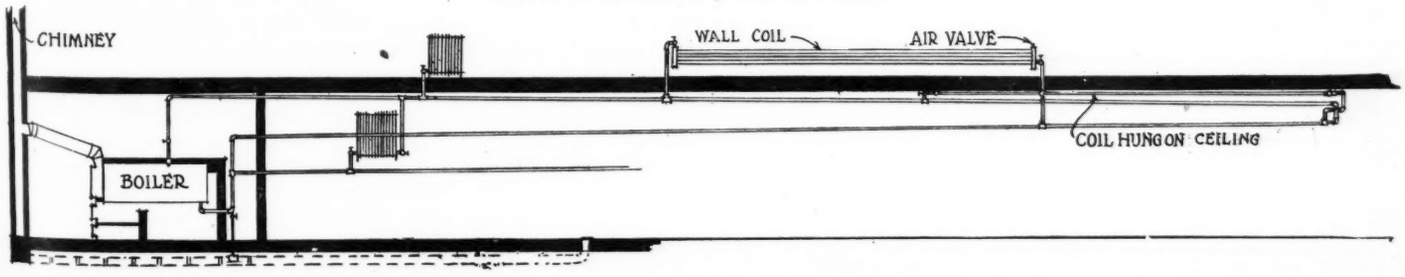


Fig. 7—If an excavation is impossible the boiler can be set on the main floor and mains, radiators and coils placed as here shown. The objection to this is the upper air becomes overheated, while the floor remains cool

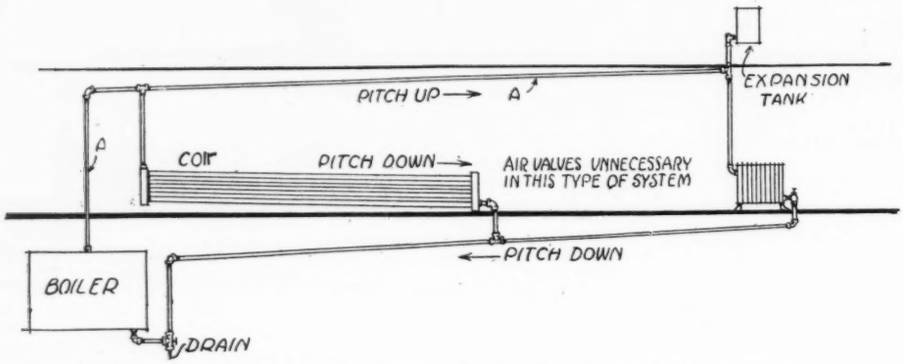


Fig. 8—The overhead hot water system is considered superior by many experts, because it puts all radiation on an equal footing as regards hot water supply

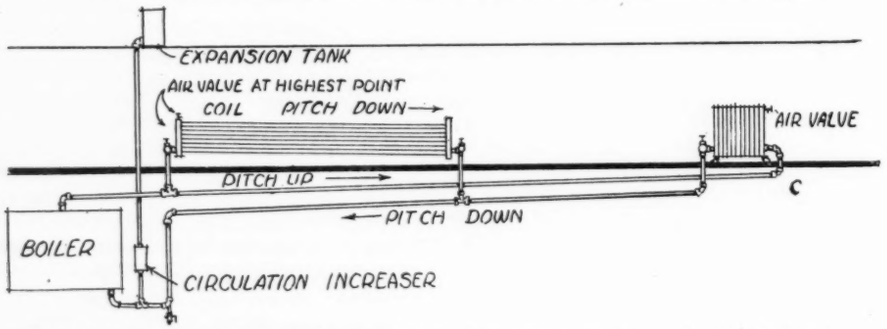


Fig. 9—Diagram showing the regulation hot water system. A circulation-increasing device makes it possible to use smaller piping, thereby reducing the expense. This device can be used with the overhead system

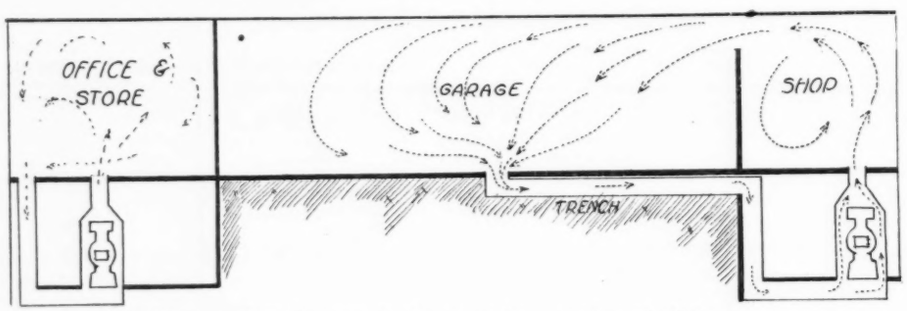


Fig. 10—The pipeless furnace is the most inexpensive of all heating systems

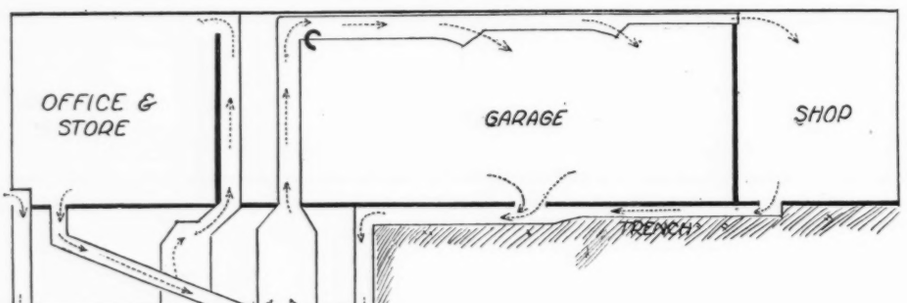


Fig. 11—A few pipes for the distribution of the heat are a great advantage in giving a more even temperature and more accelerated circulation

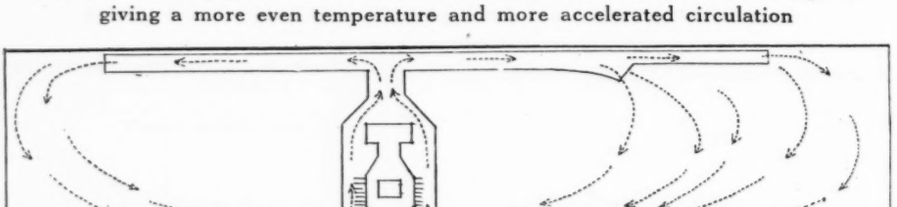


Fig. 12—Where no basement is available a scheme of this kind is as good as can be had. Put the distributing pipes A and B as high as possible to take advantage of the height of the air column to speed up circulation

between vacuum and vapor systems is in the method of producing the vacuum. One has the pump and the other has a sort of large automatic air valve in the return main in place of the pump. The water in the boiler has to be boiled at atmospheric temperature or until steam penetrates the whole system and drives out the air. Then the automatic valve closes and as the steam is condensed vacuum is formed and the plant becomes one of the vacuum variety in action.

Fig. 4 illustrates the simple principles of the low-pressure system which is the basis of all steam heating. The boiler has a space, B, above the water level which varies in size, the higher it is, the dryer the steam will be. There is a water gage, C, to show that the water is at the proper level. Steam leaves the boiler at the top passing into the main at its highest point, D, from which point it begins to flow slightly downward so that the condensation will flow with instead of having to go against it.

From the top of this main branch and risers are taken to radiators and coils. If the branches have no long horizontal runs one pipe will suffice for the live steam and returning condensation in which case the pitch will be up to the radiator so that the condensation will flow back easily. It should be a good sharp rise or the water will collect and cause pounding. When long coils are used or when radiators are some distance from the main it would be better to use a flow and return pipe as at E and F.

The diagrams Figs. 5-6-7 give the various methods of handling radiation with the different boiler locations that are met with in garage building. It is always necessary to keep the radiation above the water line, hence in the example of the boiler on the main floor all radiators are hung on the wall above the water line and coils are on the ceiling. It is a poor scheme and always gives a hot ceiling and cold floor; if you cannot have a basement for any reason, sink the boiler in a pit or use some other heating system as hot water or hot air.

Handling Exhaust Steam

Exhaust steam is handled just as low pressure steam which it really is. The condensation will be returned to the source and delivered to the boiler by a pump, however, instead of returning naturally and live steam must be supplied when the power plant is not in operation.

Coming next to the hot water we will not spend much time on it as it is the most expensive system to install and has very little to recommend it for garage work. It will cost 50 per cent to 100 per cent more than steam and is not nearly so quick-acting, especially where spread out horizontally as in a garage. It is ideal for homes where the expense is allowable and gives the most even and mild heat of any of the systems.

Fig. 8 shows an overhead hot-water system in diagrammatic form. It is best for garage use as it gives more positive circulation. The main A. A. should always be covered. Fig. 9 shows the ordinary system. It is necessary in hot water to avoid all pockets where air can collect just as it is in steam to avoid water pockets. If the main at B, Fig. 9, should be higher than c, air and gases would collect at B and shut off circulation. An air valve at B would

correct the trouble if opened occasionally.

Hot-air heat can be had in two or three forms, the ordinary house heating variety, however, is in no way suited to the garage. The long pipes under the floor would never lead the air to its destination.

One disadvantage of hot-air heat is that to get efficiency the air must be circulated through the furnace over and over rather than taken from outside where it is very cold. This is bad in that it sends all the smoke and oil smells from the garage and shop into the office and salesroom where the air should be clean and agreeable to customers.

Figs. 10 and 11 are designed to overcome this disadvantage by using two heating units; one rather smaller than the other heats the office while the other large one heats the garage and shop.

In Fig. 10 is shown an arrangement for two pipeless furnaces with a return to each furnace and in Fig. 11 a two-furnace job is shown with standpipes. These columns of heated air increase the circulation very materially just as a tall chimney increases the draft in your stove; they draw the air through the heater so fast that it does not get so hot and there is a much evener temperature in the garage as a result.

Another feature in Fig. 11 is that air is taken from outside to supply the office furnace but the return from the office goes to the garage and shop heater through D.

The hot-air furnace is the most reasonable in price of any of the satisfactory heating systems, is the quickest-acting and as economical in operation as any, that is, of course, where the air is recirculated.

Fig. 12 shows a hot-air furnace which will give good results where no basement is available.

The hot-blast idea we will not give any attention because there is no need for this kind of a system. It is adapted to schools, churches and theaters where great numbers of people are congregated and need a large volume of fresh air. It entails motors or engines to run the blowers besides a steam plant to furnish the heat and is very expensive to operate.

Liberty Fuel Expected on Market Soon

Special Motor and Airplane Product Developed by U. S. During War

CHICAGO, June 7—Liberty fuel, the special motor and airplane product developed by the Government for its war trucks and planes and regarding which conflicting reports came from Washington early in the winter, is to be put on the market in large quantities within a short time, according to Major Zimmerman, formerly in the service and who was instrumental in its development. Major Zimmerman made this statement in enlarging upon his theory that one of the greatest developments of the future in the automotive field would be the chemical treatment of fuels to increase their volatility and reduce the heat losses through cooling and exhaust.

The announcement of the marketing of Liberty fuel came in a discussion of a paper on "The Design of Intake Manifolds for the Present Heavy Fuels" by F. C. Mock, engineer of Stromberg Motor Devices Co., presented to the June meeting of the Midwest Section, Society of Automotive Engineers, last night. In answer to question as to conflicting reports of the value of Liberty fuel, Major Zimmerman said that road tests covering thousands of miles were made and that no undesirable features were shown. There was no corrosion due to its use, and in some instances the mileage per gallon was doubled as compared with gasoline. The confusion in the minds of the public with reference to the fuel, it was stated, was due on the one hand to the necessity of camouflaging not only the results, but test samples of the fuel itself, and also to certain jealousies which came up as between different Governmental departments.

Proper Carburetion

In his paper on intake manifold design Mr. Mock discussed the necessities for proper carburetion, particularly the shape and heating of the manifold. He definitely advised against any attempt to heat the fuel in the float bowl of the carbureter, because in many sections of the country there are fuels which contain a percentage of very volatile elements, casing head gasoline being a sample. gave it as his belief and hope that the time is coming when the service departments of each responsible motor car and motor truck manufacturer will develop fittings and connections of this nature to replace the equipment of cars now in service. After the patterns and tools once are made the cost of production is low, and the application probably could be made in half a day, so that the complete installation should not cost over $10 or $15.

$76,216,000 FOR TEXAS

Austin, Tex., June 6—A grand total of $76,216,000 is to be spent on roads in Texas during 1919 and 1920, according to a statement issued by the state highway department. Already approximately $50,000,000 in bonds has been voted by counties of the state, and $22,000,000 in bonds is proposed but not yet voted upon. This represents only ninety-four counties out of a potential possibility of 250 counties which can vote bonds. The Government has allotted $16,000,00 to Texas. The state highway department has an income of approximately $800,000 a year, and this will amount to approximately $2,800,000 state aid when the 1920 fees are available.

MORE CAPITAL FOR GOODRICH AND FISK

New York, June 6—Two of the largest rubber manufacturers will vote soon on capital increases to retire notes and outstanding capital stock. The B. F. Goodrich Co. proposes an increase in capital from $84,000,000 to $109,000,000. The $25,000,000 new stock will be preferred, and $15,000,000 will be sold immediately to holders of common and preferred stock. The sale of this additional stock is to provide funds to take up $15,000,000 two-year notes maturing next November.

The directors of the Fisk Rubber Co. will offer to stockholders $15,000,000 new first preferred stock and $2,500,000 new second preferred stock. Present first preferred stockholders of record June 10 and present second preferred and common stockholders of record July 15 will have the right to subscribe. Funds from this sale will be used to retire the $4,025,000 outstanding first preferred and $5,000,000 convertible first preferred stock and will leave an increase in the capital of the company of $8,475,000.

CLEVELAND TO INCREASE CAPITAL

Cleveland, Ohio, June 6—The Cleveland Tractor Co. will increase its capitalization $1,980,000. Stockholders will be given first opportunity to subscribe to the new stock. A stock dividend of 10 per cent has been declared, and an initial quarterly dividend of 1½ per cent.

TRUCK BUREAU FOR SAN ANTONIO

San Antonio, Texas, June 6—A ship-by-truck bureau for the operation of truck lines on short haul routes between towns in the trade territories with San Antonio as headquarters has been established at the local branch of Firestone. While the ship-by-truck movement has become an integral part of economic distribution in many centers of America it is a new departure in San Antonio so far as competing with the railroads and handling transportation on short routes is concerned.

The branch is compiling a directory for the bureau, and all information concerning routes and operation schedules will be furnished free to the operators. The ultimate development will be the erection of a great truck terminal from which the short haul traffic can be directed. In addition it is contemplated that a central warehouse or freight depot will be maintained, where loads may be received and discharged.

ALLEY USED BERLING

In MOTOR AGE for last week in giving the equipment of the Indianapolis winners Alley's Bender Special was listed as having a Bosch magneto. This should have been a Berling magneto, the car carrying two of them.

Garage Planning
Service Station Arrangements

No. 61

Enlarging and Remodelling

Q—We wish to extend our building to the right as shown on the drawing; our present building is represented to the left and is 40 by 100 ft. We wish to have a women's restroom but do not know how and where to locate same. We expect to use the old part of our building for storage. Where our present stockroom is, we wish to enlarge its size and use it as an office and accessory salesroom, with large showcase and inclosed glass shelving to rear of showcase.

The building is to be skylighted. To rear of showroom we want a shop. We expect to use three men there, one in vulcanizing and battery work, one in the office. From the shop extending to the old building we will put an overhead trolley as marked. We expect to have the following tools to place in the shop: forge, welder, emery wheels—large and small, lathe 16 by 8, water and air pumps, large burning-in and testing machine, press and drill press.

We have a few large signs which we wish to place on the highway. What do you think of the following: Star Garage (at top); (below) Let us Serve and Direct You. Our Equipment Is Modern, Building Is Fireproof. Phone 41.—Star Garage, Jonesburg, Mo.

There are two objections we have to your plan as shown on your pencil sketch. One we have tried to correct, but the other seems almost impossible unless you were to knock down your dividing wall and make an entirely new start. It is always difficult to remodel or add to an old building and get a good plan, and your problem is no exception to the rule.

The first objection is that the 40 ft. width of the old building which you plan for your garage is not wide enough to make good storage space. With a double row of cars it is almost impossible to maneuver a fair-sized car into a given position. We have made storage space for the large cars by making a cross aisle into the new part, reserving the space along the solid wall for Fords and other small cars which can be run in and out without difficulty.

The other objection is that your departments were too much scattered. The machine shop should not open into the salesroom, bringing all its noise and disagreeable smells to play upon the customer just when you may be trying to close a deal. The salesroom should be as quiet as possible, the farther from the shop the better. Repairing and selling are totally different branches of the trade, and some even claim they should not be handled by the same organization, though that is going too far in the specialization proceedings for a small town.

If the accessory stockroom is not large enough, as it probably is not, if you are handling tires to any extent, it can be enlarged as indicated by the dotted line surrounding B.

The tire and battery rooms would be better near the repairshop, but there is no necessity of locating them there and as there is no good light we think their present location the best. They complete the group started by the rest rooms.

MOTOR AGE is receiving many inqiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquiries are urged in asking for such plans to be sure to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

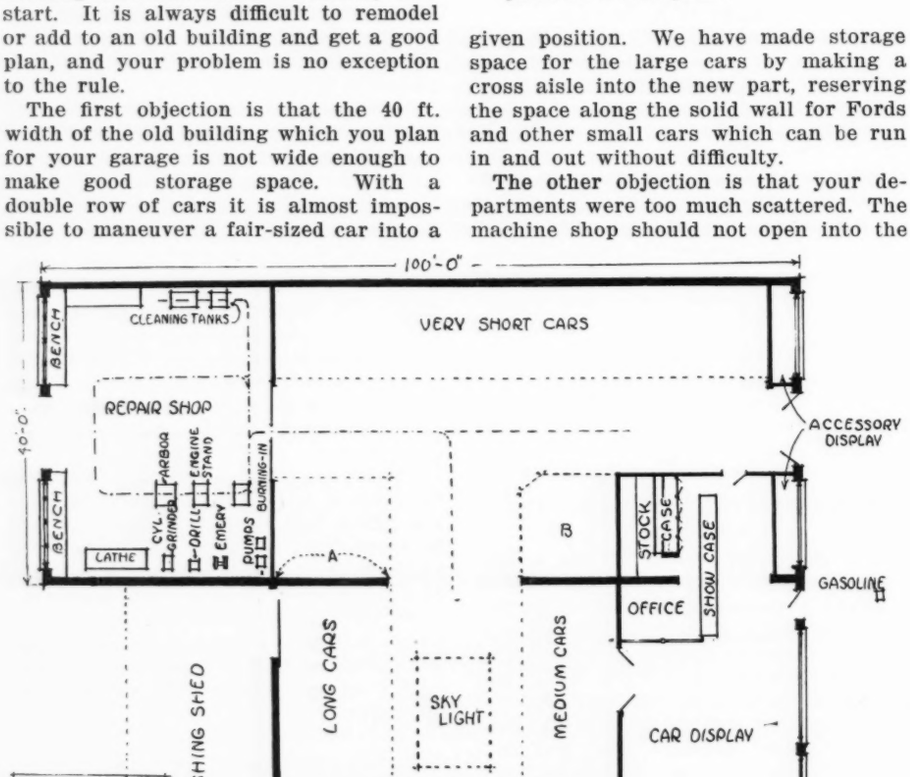
What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.



This plan is drawn for a garage which is remodeling its place

No. 62

Office and Accessory Store

Q—We are attaching a floor plan of office and accessory room and would like your suggestions for arrangement of office, showcases, shelves, part bins, tire racks, etc. We wish to inclose one corner, say 10 by 12, for private office and bookkeeper. The balance of the space is to be used for accessories, tires, etc. We have a good building and a large volume of business and would like the most advantageous arrangement.—Erskine Garage, Erskine, Minn.

There is not much to be said about this layout as it is very simple and plain. The accessory stockroom may be considered too small, but it will hold a good supply if the tires are carried on racks above the other shelves. A ladder such as is used in hardware and shoe stores may be used as the ceilings are undoubtedly high, and considerable advantage may be taken of this upper space which may even be extended over the office, the ceiling of which could be lowered to 8 or 8½ ft.

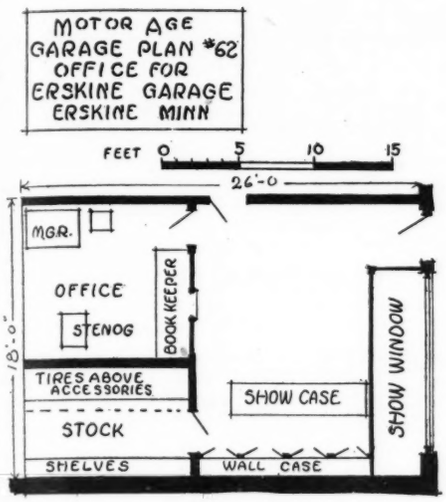
No. 63

Garage in Middle of Block

Q—My lot is 50 by 120 ft. and I wish the garage to be 50 by 110. The lot is in the middle of a block and on one side there is a building 70 ft. long, and there will probably be a building on the other side 100 ft. long.

The showroom will need space for two cars, and a shop about 30 by 50. I will have a lathe, drill press, emery wheel, power hack saws, press generator and engine for charging batteries. I wish steam heating plant. The front will be made of mottled pressed brick and the rest of 12-inch hollow tile.—R. C. Franke, Mullen, Neb.

The layout you submitted seems to fill the requirements very well and we have simply whipped it into shape with a few minor changes. We have moved the machines to the light end of the shop, which is also the small end. The space in it is less desirable for overhauling



Arrangement of office and accessory store

purposes, though there is plenty of room for everything you have and more.

Some terra cotta trimmings would improve the appearance of your front elevation by setting off the brick and giving it more snap. These can be purchased from the terra cotta companies in stock mouldings and caps of various designs. MOTOR AGE will run an article very soon showing all the 57 varieties of heating that can be applied to garage use; you may get some hints from that.

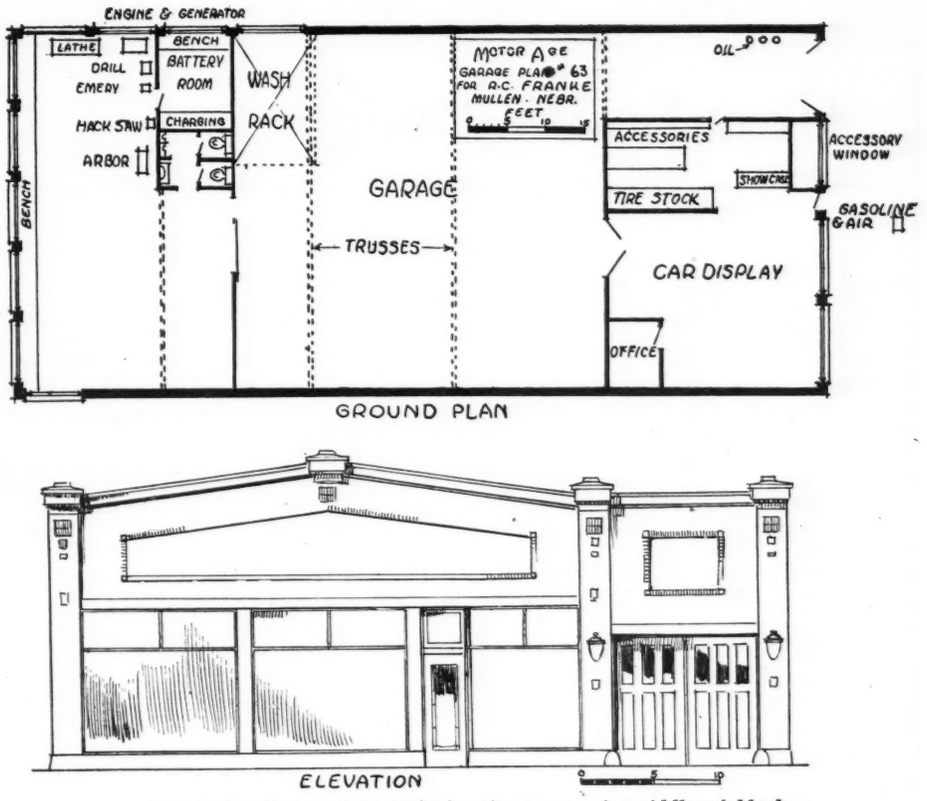
If you support your roof by trusses, which you probably will, you should fill the hollow tile with cement and four re-enforcing steel rods, forming them thus into a very substantial column. The rods should be set in the foundation and the tile strung on them as the wall grows. The rods need not be the full height of the wall, but if shorter pieces are used they should be overlapped a foot or more and the joints not all in one place. Tile alone does not make a very good support for trusses as in expansion and contraction of the truss the tile are likely to work loose. A re-enforced concrete block cast in the place of several of the top tiles where the truss is to rest would also do all right.

No. 64

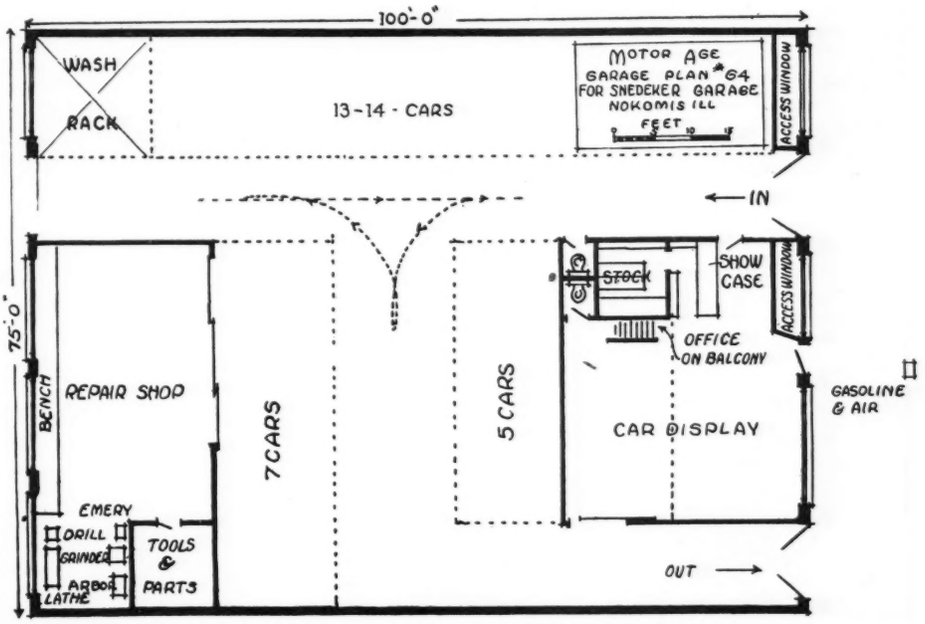
Two Entrances Take Show Space

Q—The garage we build will be on a lot with 75-ft. frontage and a depth of 100 ft. The lot is located near the center of the block with an alley in the rear. I want two driveways in the front of the building so as to be able to drive in and not have to back out, also an opening in the alley. The showroom should be large enough for three cars, workshop enough for four mechanics, an office with 160 sq. ft. of floor space, a stockroom with 90 sq. ft. of floor space, a washrack large enough for two cars. I want to store all the cars possible.—R. W. Snedeker, Nokomis, Ill.

Your idea of having two entrances is a good one but takes a lot of room both in storage and show window space. For instance, if we should extend the office to the right as one faces the front, making the passage against the wall, we would kill storage space of at least six cars. We cannot make the showroom and office space much deeper or we would not have room for two rows of cars



Front elevation and ground plan for garage in middle of block



Placing the balcony in the office saves much space here

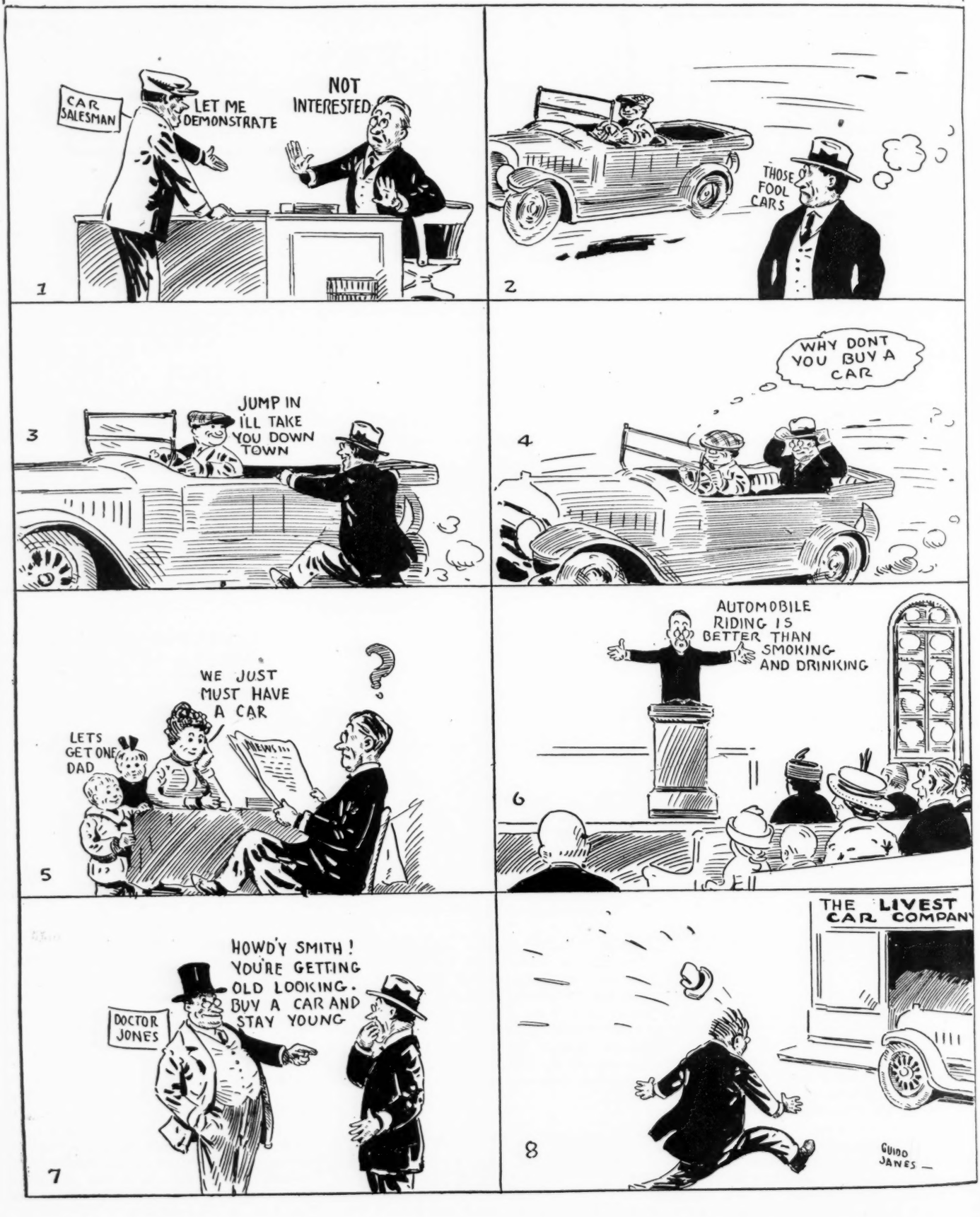
behind with a suitable aisle between. The display room could be extended to the left closing up one entrance and making the intersection A of the aisles serve as a Y for turning cars around.

Everything considered it would probably be best to construct a balcony over the rear of the display rooms to serve as an office, leaving the plan as it now stands.

WOULD RESTRICT TRACTORS

Harrisburg, Pa., June 6—Now it is intended by certain state legislators to place restrictions on tractors, as well as traction engines, in so-called defense of the public highways of Pennsylvania. At a conference on the Eyre bill, prohibiting traction engines or tractors on state highways, it was agreed that the provisions, which become effective Jan. 1, 1920, be amended to provide for the examination by the highway department of all traction, or tractor, equipment for which a state license shall be asked. Such engines as do not conform with the regulations of the department will be denied a license. It was further agreed that experiments be jointly conducted and a careful investigation made of the effect of the operation of tractors with cleats. It is now held that cleats should be limited to a width no less than 1 in. at road surface.

How Smith Bought a Car in Self-Defense



The Motor Car Repair Shop

Practical Maintenance Hints

Charging Batteries With Old Generator

THERE is hardly a town in the country now that does not boast some sort of electric lighting, which means a source of current for garage uses, including charging batteries. It is not always the case, however, that a direct current is found and this is necessary in battery charging.

As is well known it is necessary to transform an alternating to a direct current and this involves rather expensive rigging in the form of some sort of rectifier, so that unless a place has a very considerable amount of charging to do this outfit would prove rather an expensive investment.

But this may be easily and cheaply overcome by the installation of a motor car lighting generator and almost any means of driving this piece of machinery—either by an electric motor through an alternating current, a small gasoline engine, water motor or anything else that furnishes constant power.

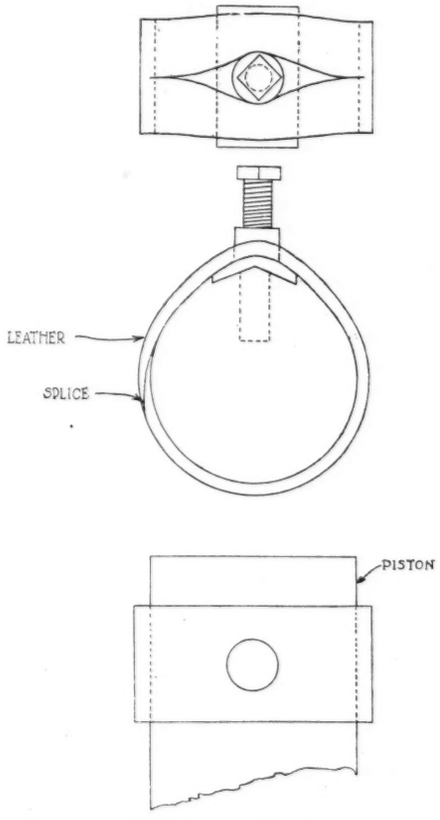
South of 39th street in Chicago the electric light current is alternating, so one garage man has solved the problem of charging batteries in a unique and simple manner by driving an old lighting generator through means of a ⅛-hp. electric motor.

Apparatus Costs Little

The arrangement is simple and inasmuch as a generator can be picked up at some of the car wrecking concerns for a nominal sum, the whole cost does not involve a great outlay. The generator is mounted on a heavy block of wood—or base of iron—as is the electric motor, the two being coupled by an Oldham coupling. It would serve quite as well to have a leather universal joint; or, for that matter, they could be coupled direct if the alignment is perfect.

The electric motor is coupled up to the electric light supply, while the generator wires run to the battery, but, of course, an ammeter is interposed in the circuit so the charging rate may be watched. This may be gauged, too, by the number of revolutions of the electric motor so that any desired rate may be obtained.

As stated before other means may be employed, such as using a water motor; nor is it necessary to couple the charging generator and the electric or other source of power as shown herewith. They may be placed side by side and sprockets and chain used, or even a belt, but the latter would not be so positive and besides there would be some loss in the possible stretching of the belt. Probably the most simple installation would be with a chain and two sprockets, for by changing a sprocket the speed range of the generator could be made more secure. While this would be the simplest installation it would require more attention in the long run than if the direct coupling were used, for this would require no attention after the first installation.



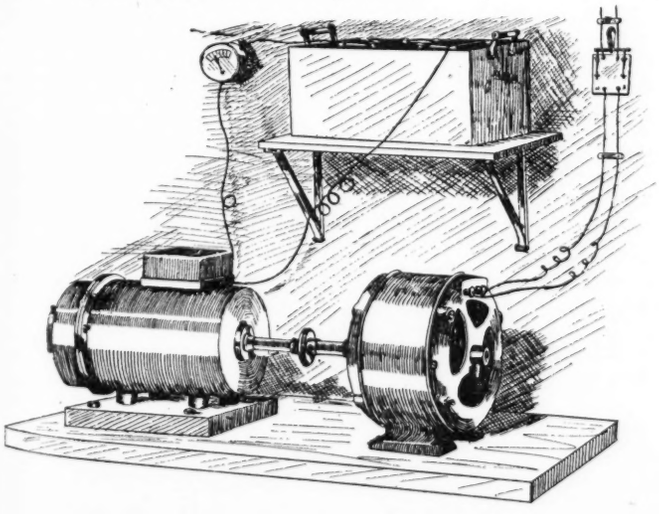
Piston pin remover

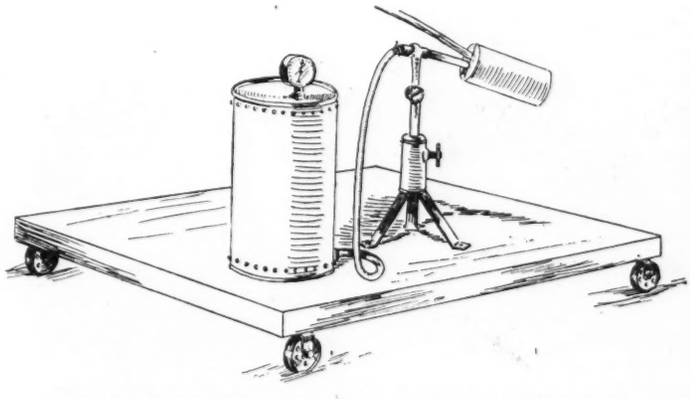
Kerosene Torch

A large-capacity kerosene torch is a feature worth having in any service station. It is cheaper than acetylene and may be used for heating frame members and the like, which require straightening, and also is of use in heating parts to be brazed or welded, thus conserving acetylene. The sketch shows the kerosene tank and adjustable torch stand mounted on a small truck so that it readily may be wheeled to the work.—Packard Motor Car Co. of Boston.

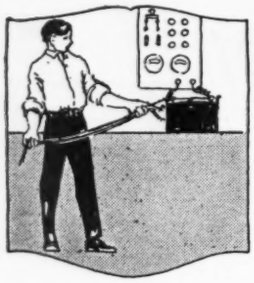
Piston Pin Remover

The small, light aluminum alloy pistons of to-day are easy to damage if care is not taken in removing the wristpins. The tool shown will remove any piston pin without damaging the piston in the slightest. It consists of a saddle-shaped member through which a screw for pushing out the pin is mounted and a heavy leather strap—the latter can be made by any harness maker. The piston is placed in the strap so that the screw registers with the wristpin and then by turning in on the screw the piston pin is forced out.





Above is shown the portable kerosene torch which is described, while at the left is the apparatus a Chicago garageman uses to charge batteries



Electrical Equipment of the Motor Car

By David Penn Moreton & Darwin S. Hatch.

Editor's Note—Herewith is presented the 150th installment of a weekly series of articles begun in Motor Age, *issue of June 29, 1916, designed to give the repairman and motorist the knowledge which will enable them to care for and repair any and all of the electrical features of the car, no matter what make or model it may be.*

The first half of this series has been published in book form by the U. P. C. Book Co., Inc., 243-249 West Thirty-ninth street, New York, and is sold at $2.50. The remainder of the series will be published as a supplementary volume.

Part CL—USL Electrical Systems

AN exploded view of the electrical unit for this system is shown in Fig. 730 and a typical wiring diagram is given in Fig. 731. The battery used with this system consists of twelve cells divided into two groups of six cells each. These two groups are connected in series by the special starting switch when the electrical unit operates as a starting motor and in parallel when the electrical unit is operating as a generator. The lights are operated on either the two- or three-wire plan, as shown diagrammatically in Fig. 731.

Seven of the eight poles of the electrical unit have a series winding on them, and the remaining pole is provided with a shunt winding. The poles on the opposite sides of the pole having the shunt winding on it are of the same polarity as the shunt pole. The demagnetizing effect of these poles upon the shunt pole acts to prevent the output of the generator from becoming excessive.

The cutout is of the electromagnetic type and is carried on the engine side of the dash. Two fuses are mounted on the cutout base, one, of 6-ampere capacity, in the shunt field circuit and the other, of 30-ampere capacity, in the main circuit of the electrical unit. A touring switch is provided, and its operation will be obvious after an inspection of the wiring diagram. An indicating ammeter is mounted on the dash and is connected in the circuit from the positive terminal of the battery to the touring switch.

12-12 Volt System, Inherently Regulated

A typical wiring diagram of a 12-12-volt system is given in Fig. 732. The electrical unit has four terminals, the automatic cutout has four and the starting switch has three. The three terminals of the starting switch are connected together when the starting switch is in its closed position, and no connections are made through the starting switch when the electrical unit is operating as a generator. The touring, ignition and lighting switches all are combined in a single unit.

A compensating field coil is used in addition to the shunt and

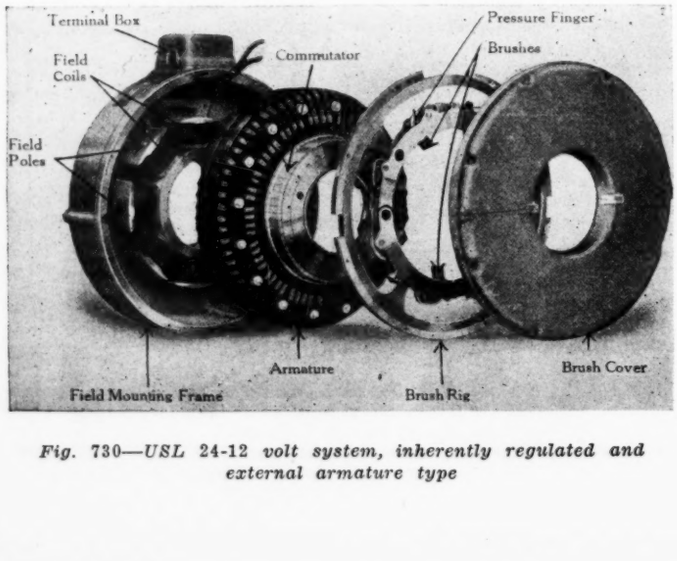


Fig. 730—USL 24-12 volt system, inherently regulated and external armature type

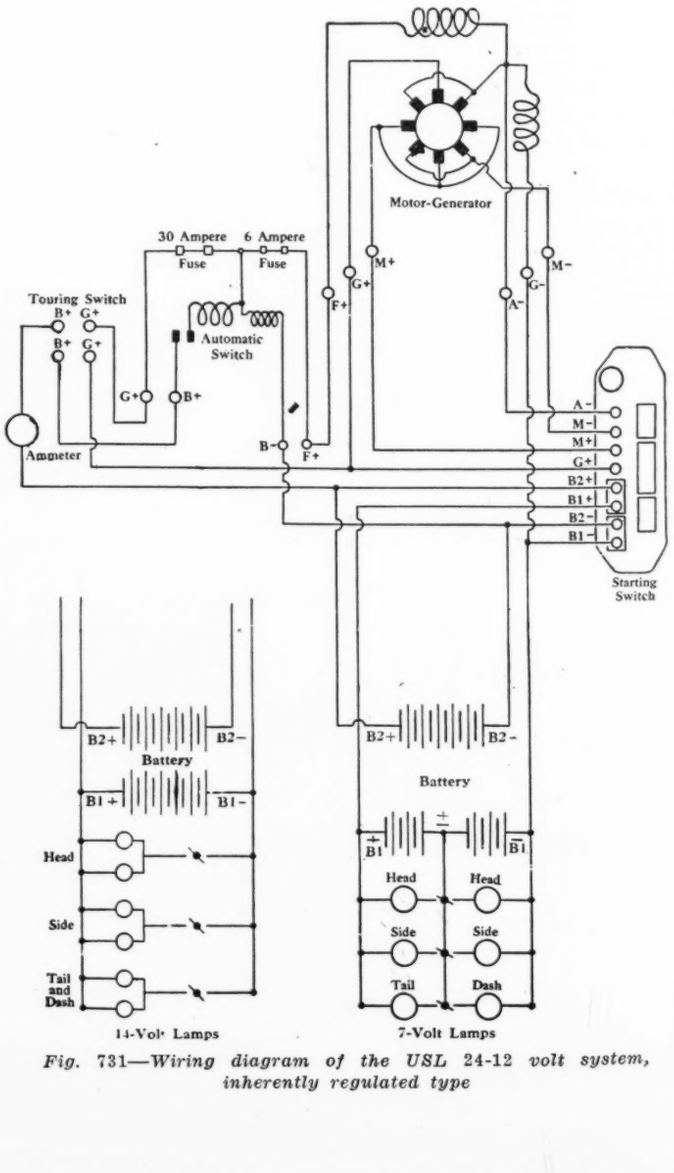


Fig. 731—Wiring diagram of the USL 24-12 volt system, inherently regulated type

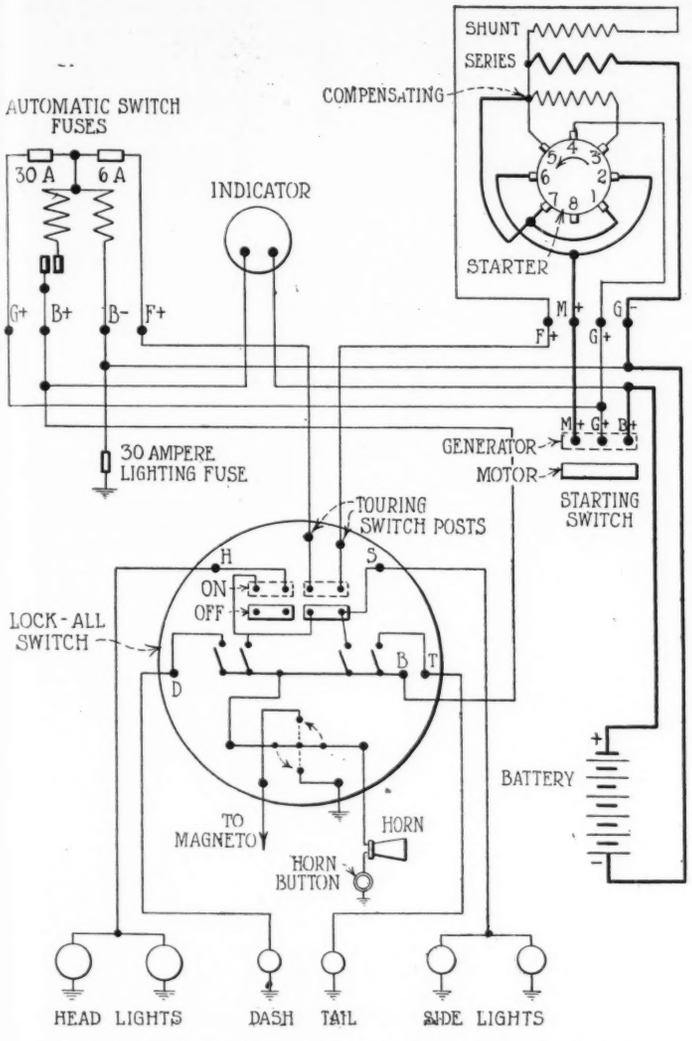


Fig. 732—Wiring diagram of the USL 12-12 volt system, inherently regulated type

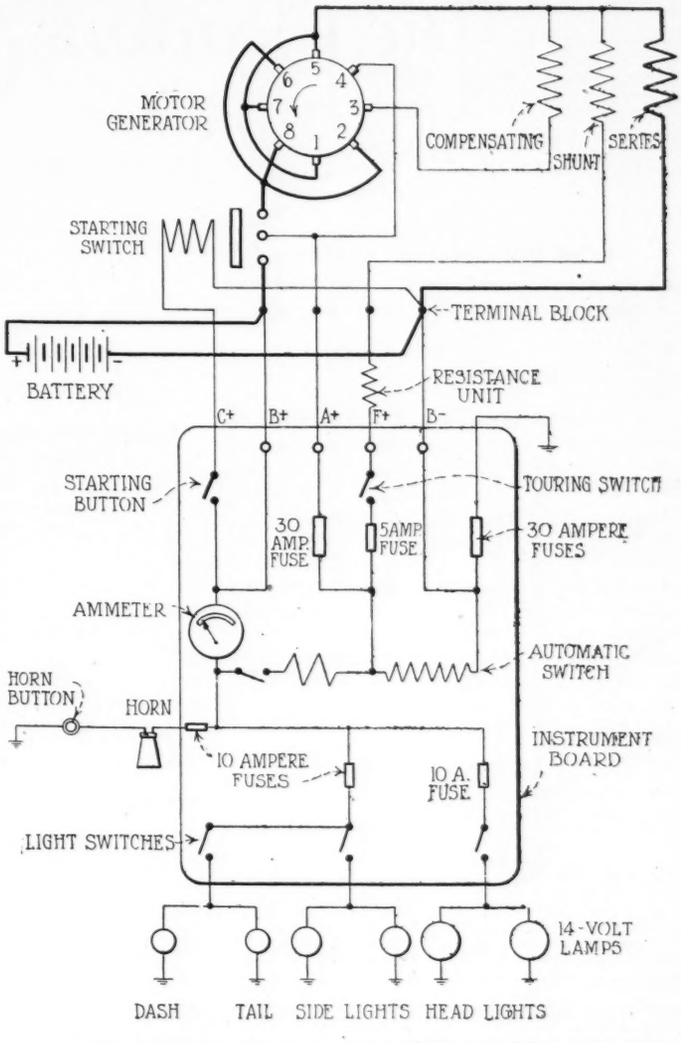


Fig. 733—Wiring diagram of the USL installation on the 1916 Mercer

series field coils described. This compensating field coil is connected to brush No. 3, as shown in the diagram. The object of this compensating coil is to weaken the magnetic field with an increase in speed, but this effect is not very noticeable until the generator has practically reached its maximum output.

A wiring diagram of the USL installation on the 1916 Mercer is shown in Fig. 733. This is a two-unit, two-wire system. The generator has inherent regulation due to the combined actions of a series and compensating field winding. The starting switch is operated magnetically by closing the starting button on the dash.

On the 1917 Mercer cars a magnetic switch is used to open and close the shunt-field circuit. This switch closes and connects the shunt field directly to the battery unless the touring switch is open. Supplying current direct from the battery to the shunt field winding causes the electrical unit to pick up quickly.

AERIAL EXPRESS IN TEXAS

San Antonio, Tex., June 6—As the giant seabirds of the American Naval Air Service swept out across the Atlantic in their epoch making flight to link closer the old and the new world, commercial airplane history was in the making in Texas. At 3 o'clock in the afternoon the first commercial passenger and express plane of the Fort Worth Aerial Transportation Co. completed the last leg of its initial flight in the express service when it landed at Kelly field.

Within four weeks regular aerial passenger and express service will be established between San Antonio and Fort Worth via Dallas, Waco, Houston, Galveston, Flatonia and other points yet to be selected, it is stated.

A delegation of San Antonians, army officers and dealers greeted the air express.

As soon as the line is in full operation, it is said, the name will be changed to the Texas Aerial Transportation Co. Landing fields will be laid out at all stations on the air line, and regular schedules will be maintained. At least three planes will be stationed at each city on the route.

TO HOLD TRUCK DEMONSTRATION

Washington, June 6—The Washington Automotive Trade Association will hold a truck demonstration here June 28 to demonstrate the ship-by-truck movement. Contributions were made by the different agencies to provide for the necessary advertising and prizes. A large parade with several Government trucks in line is expected.

The association will hold an outing June 10 for all members, who now number seventy-four regulars and eighteen associates.

TEXAS GETS ARMY TRUCKS

Austin, Tex., June 7—The Texas highway department has received shipping instructions covering an allotment of 313 trucks made to Texas by the Government. The first allotment consists mostly of 2-ton Nash Quads and will come from Indianapolis, Jeffersonville, Chicago and Streator, Ill., while 100 of them will be gathered from Texas army camps.

The trucks in turn will be awarded by the state highway department to various counties of the state for use in road work.

The Federal road act, under which the trucks are distributed, specifies that ex-soldiers be given preference of employment in the distribution of the trucks. The state highway department is suggesting that counties obtaining the trucks employ ex-soldiers to operate them, whenever possible.

The Readers' Clearing House

Questions and Answers

Conducted by B. M. Ikert

Using Different Sizes of Tires

Q—I have had two of my tires half-soled with Gates half-soles. I am using these tires as extras on my Dodge Brothers car. These tires are oversize. Would there be any harm in using one of them on rear or front, whichever the case may be?—Fred Beutelspacher, Brainard, Minn.

It is never a good plan to equip one rear wheel with an oversized tire and the other wheel with a smaller tire. The reason is that the differential is strained rather severely. The difference in size in the wheels causes the differential gears to operate continuously, going along good road. If an oversized tire is placed on the front wheel having the speedometer connection, the recorded mileage will be under its correct value. Other than this, there is no harm done by placing different sizes of tires on the front wheels.

Why Ford Leaks Oil

Q—Grease leaks out on the rear wheels of a 1915 Ford which has been driven about 11,000 miles. I notice that the larger cars have little tubes to carry the grease out away from the brakes and believe that in the Ford if there were two ¼-in. holes on the under side of the housing as near the outer bearing as possible, the trouble would cease, the holes being not so much a place for grease to leak out as a place for the heated air to escape. I notice that at the beginning of a run the housing would be cold but after driving 8 or 10 miles at a fair speed the temperature rises to possibly 120 deg. Naturally the air in there must expand, and as it expands the only exit is the end of the housing through the bearing and into the brake drum. I have never tried this remedy and would like your opinion in the matter.—D. W. Walker, Centralia, Mo.

The trouble with your car is that the oil is leaking down through the torque tube, filling up the rear end, and then this excess leaks out through the brake housing. To remedy this condition, Fig. 3, place a felt washer at F, on the universal joint coupling. Then place steel washers against the felt washer as shown. For the size of the three washers see the dimensions in the illustration. To put these washers in place, remove the rear axle and rear half of the universal joint, then remove the front universal cover over the ball cap. Put the felt washer on as shown by placing them over the transmission shaft. The pin holds the washer in place.

Miscellaneous

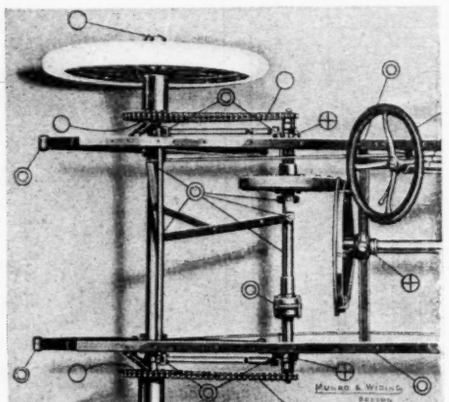


Fig. 1—Rear axle and gear construction of 1914 Metz car

Pulley on Bull Tractor

Q—Would you advise the use of a larger pulley on a Big Bull tractor than the one furnished for belt work. The power needed is not more than half of what is required to gain belt speed with the original pulley.

2—Where can I get repairs for this machine?

3—Is their engine sold now?

4—Publish rear axle and gear construction of a 1914 Metz, five-passenger touring car.

5—What did this car sell for?—R. F. McCarty, Ottomen, Va.

1—There is no reason why a larger wheel cannot be used if the power that you desire is less than the engine produces at the correct pulley speed. It is well to remember though that the pulley of the engine is of the correct size, calculated to give best results at the engine's most efficient speed.

2—Parts for this tractor can be secured from the Bull Tractor-Madison Motors Corp., Anderson, Ind.

3—We do not know whether the engine you have in your tractor is the same as the one in the present Bull tractor model for you do not tell us the model of your tractor.

4—See Fig. 1.

5—It cost $495.

Wants Race Car Pictures

Q—Publish photographs of Dario Resta's Sunbeam, Jules Goux's Peugeot and Earl Cooper's Stutz used in the Indianapolis race May 31. Also show the Hudson Special of Eddie Pullen's.

2—Are the British Rolls-Royce airplane engine and the Italian Fiat airplane engine not as good engines as the American Liberty engine?—R. Leighton Rutledge, St. Louis, Mo.

1—These photographs appeared in the May 29 issue of MOTOR AGE.

2—While it must be admitted that the American Liberty aviation engine is a masterpiece of designing, we do not believe that it can be said truthfully that such engines as the Rolls-Royce or Fiat are not as good as is our Liberty engine. Our engine probably was the first to develop such an enormous horsepower at such a low ratio of weight to power. Our engines though did not have the hand work on them that the European engines do. It has been said that these European engines are like a high-priced watch. These engines are built by skilled workmen, each piece fitted to the other by hand. While this construction does not permit of a great degree of interchang-

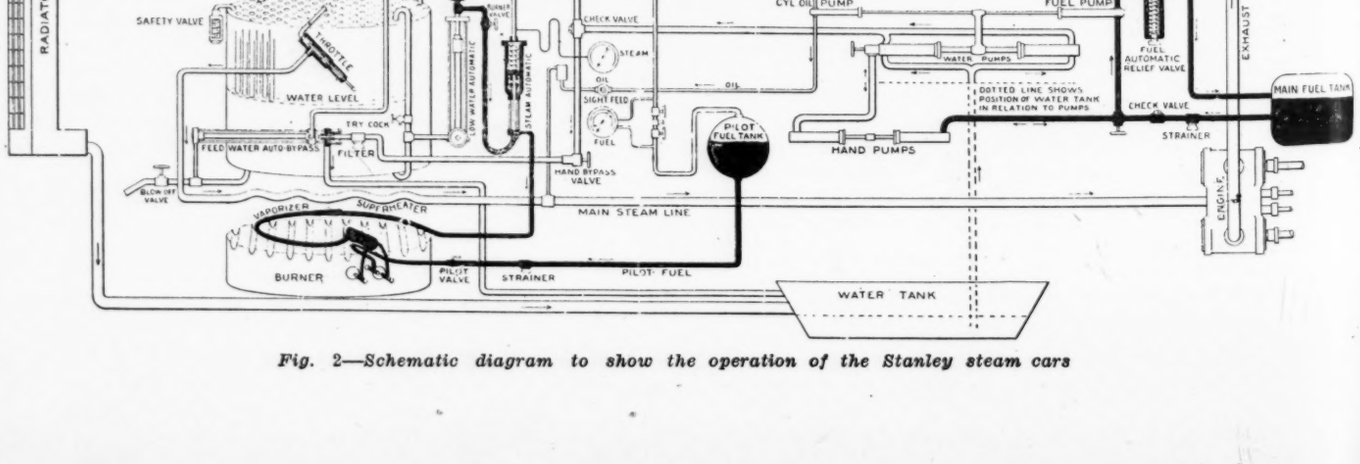


Fig. 2—Schematic diagram to show the operation of the Stanley steam cars

ability, it does permit of a very smooth-running engine. When a question of quantity production is considered, then it is seen that this slow and tedious hand-working process is too expensive. In this respect our Liberty engine is better. It is designed so that any part of one engine will fit with the corresponding part on another engine.

F. R. P. and Singer Cars

Q—Publish picture of an F.R.P. car and a Singer car.

2—Give the names of some of the cars made in Portugal and Spain.—Nelson L. Washburne, Rochester, N. Y.

1—The Singer is shown in Fig. 4, but the other is not available just now.

2—The Hispano-Suiza car was made in Spain. Information as to others is not available.

To Cure Car of Jerks

Q—Explain the no-glare feature of the Old Sol nitrojector.

2—Is the Sterns Tire & Tube Co. still in business?

3—Do they still manufacture the puncture-proof tubes?

4—A 1918 Ford runs with a jerky motion on a hard pull in high, although with the cut-out open the engine does not seem to be missing. Suggest a cause and remedy for this.—Theodore Whelan, Dubuque, Iowa.

1—The Old Sol spotlight has an aluminum bell housing that slides over the bulb. The intensity of the light that the lamp projects is dependent on this dimming shield.

2—This concern is out of business.

3—No.

4—This jerky motion of the Ford car which you describe can be eliminated by adjusting the low- and high-speed transmission bands. These bands, when they become smooth and worn, grip the drum in hit or miss fashion. New bands invariably will remedy this trouble.

Steering Gear Probably Wrenched

Q—Who are the manufacturers of the Jacox steering gear?

2—The steering gear on my 1916 model 34 Haynes light six has been unsatisfactory, the operation being stiff and not improving with use. The later Haynes models are equipped with different gear. The Haynes company can suggest no method of improving the operation of my old gear and reports that the new gear can be installed only by re-drilling and re-enforcing the frame. Can you suggest any method of improving the old gear without these alterations?

3—Is it possible to secure a Jacox or other good steering gear that can be installed in my car without altering position of the gear where attached to frame?

4—I notice numerous advertisements in MOTOR AGE of tire jobbers who supply rebuilt tires at very low price and who advertise new seconds of standard makes at very much reduced prices. Without asking you to recommend any particular concern, can you tell me whether it is generally good economy to buy these tires, with special reference to cord seconds of standard makes? —C. B. Robinson, Orlando, Fla.

1—Jackson Church Wilcox Co., Saginaw, Mich.

2—If Haynes has not been able to suggest any means to improve your steering gear, certainly it would be inexpedient for us to try to suggest a means to improve the Haynes company's product. It would seem from your description that the steering gear has been wrenched and some member twisted so that the bearings do not line up correctly. This could be caused very easily by a severe strain on the steering wheel or the front wheels or lack of lubrication. We advise that you have these different parts

TO assist readers in obtaining as a unit all information on a certain subject MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

MISCELLANEOUS

Fred Beutelspacher. Brainard, Minn.
D. W. Walker.....Centralia, Mo.
R. F. McCarty.....Ottoman, Va.
R. Leighton Rutledge. St. Louis, Mo.
N. L. Washburne..Rochester, N. Y.
Theodore Whelan...Dubuque, Iowa
C. B. Robinson.....Orlando, Fla.
John C. Brinner, Jr...St. Louis, Mo.
J. A. Sheeley.....Roanoke, Va.
H. R. Ford.....Boston, Mass.
W. H. Thompson.....Deport, Tex.

ENGINES

J. A. Roper.....Buffalo, N. Y.
J. E. Olson....Walla Walla, Wash.
F. A. Werk.....Tiffin, Iowa
C. L. Robinson..Pearl Harbor, T. H.
C. B. Robinson.....Orlando, Fla.

CARBURETION

W. Wilson.....Great Falls, Mont.
Joseph Huwiler. San Francisco, Cal.
L. J. Heffern.....Covington, La.
C. E. Tobias...Salt Lake City, Utah
Howard T. Dimick..Shreveport, La.

THE ELECTRIC SYSTEM

Arthur Henrikson.....Chicago, Ill.
F. D. Newton.....Joplin, Mo.
W. W. Bolivar.....Floris, Iowa
J. H. M. Campbell.....Toledo, Ohio
Wake & Dixon....Knoxville, Iowa
L. S. Billington...Marysville, Kan.
N. Batinovich.....Aberdeen, Wash.
H. R. Ford.....Boston, Mass.
W. S. Colwell.....Louisville, Ky.

REBUILDING

D. C. Foster.....Des Moines, Iowa
J. E. Reynolds....Los Angeles, Cal.
John Leman:.....Eureka, Ill.
Dewey Mauk.....Eakley, Okla.

No communication without the writer's name and address will be answered in these columns.

tested for alignment. The Jacox steering gear is giving perfect satisfaction in the hands of thousands of owners and we do not believe that your gear cannot be made to work properly.

3—We believe it would be cheaper for you to have your present steering gear overhauled and put in good condition.

4—The success of a rebuilt tire is dependent upon two things, one, the integrity of the rebuilder, and the other, the tire itself. Rebuilt tires and manufacturers' seconds generally are offered without a guarantee. A rebuilt tire or a second can have several things wrong, none of which will be apparent to the eye. Some of these injuries or defects may not affect the wear of the tire at all, and it will give just as much service as a new tire. Then again there are cases where a second tire has given only a few miles' service, after which it would blow out. Now if you happen to get one of these poorly rebuilt tires which lasts only a few miles, then it is false economy to buy them, but if the tire gives real service, then there is money saved.

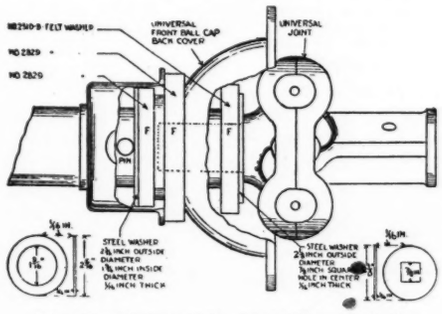


Fig. 3—For use in repairing oil-leaking axle on Ford car

Lowering Steering Wheel

Q—Give instructions to raise carbureter and put a foot accelerater on a 1912 Regal.

2—Give instruction to lower stearing gear to make a racer out of it.—J. A. Sheeley, Roanoke, Va.

1—This is simply a question of having a new manifold made with a standard carbureter flange attached. Or the old one can be shortened by cutting a piece from the vertical portion and then having this welded by a blacksmith who has an oxy-acetylene welding outfit.

2—In Figs. 5 and 6 we show the steering gear as it is on your car now. To lower it cut two blocks from a piece of oak, or other hard wood, and insert them behind the column where it enters the dash, as shown.

Operation of Steam Car

Q—Explain operation and construction of Stanley steamers.

2—How does the power developed compare with the gas car?

3—Where can instruction books on these cars be obtained?—John C. Brinner, Jr., St. Louis, Mo.

1—As the name implies, the Stanley is propelled by steam power. The steam is generated in a fire tube boiler, at a pressure of about 600 lb. to the square inch. The water level in the boiler is maintained automatically by a feed water pump driven from the rear axle and operating in conjunction with a feed water by-pass. The car burns kerosene, except the small pilot light, which burns gasoline. The burner is started by an electric push button and the flame, being

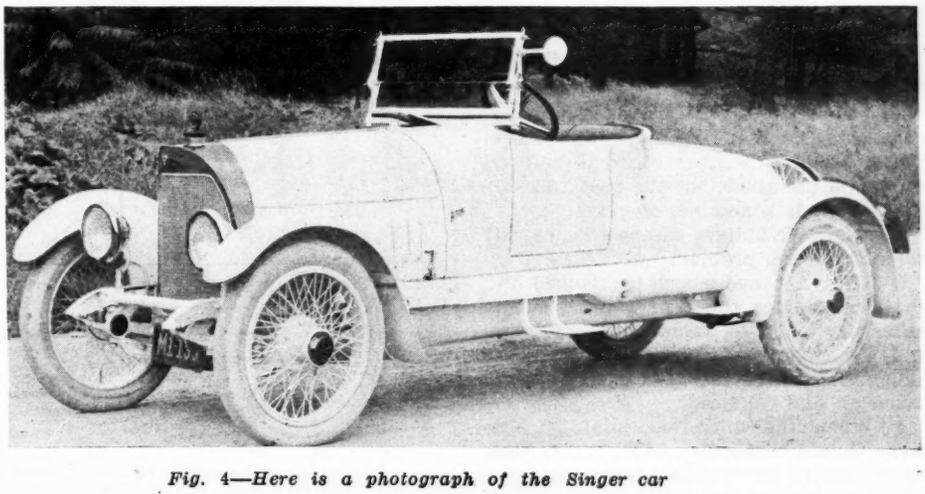


Fig. 4—Here is a photograph of the Singer car

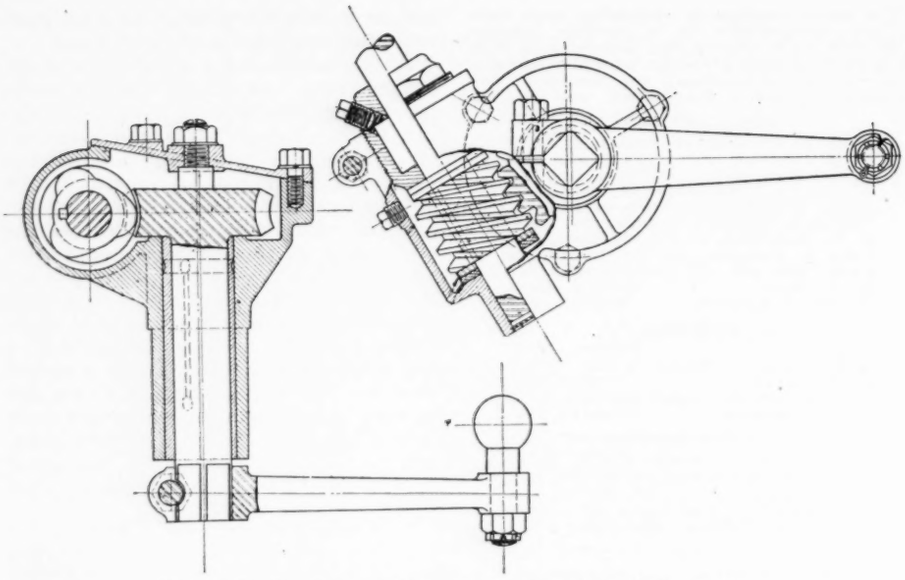


Fig. 5—Sectional view of steering gear on a 1912 Regal car

automatically controlled by the condition of the steam pressure. When the steam pressure is high the fire is low. The steam, as it is used from the boiler, operates a two-cylinder double-acting steam engine, and after passing through the engine the steam heats a feed-water heater and then passes on to the condenser at the front of the car. The water then is condensed, passed on to the water tank and is used over again.

2—A steam car is capable of exerting an enormous starting torque. High steam pressure enables the car to accelerate very rapidly and in a short space of time can reach very high speed.

3—Instruction books can be obtained from the Stanley Motor Carriage Co., Newton, Mass.

Overland Timing Gears Noisy

Q—The model 79 T Overland which has gone about 50,000 miles and which I recently overhauled runs fine except that the timing gears are very noisy. Would a new set of gears from the factory cure the trouble, or is this characteristic of the engine?

2—New crankshaft, connecting rod, magneto and front camshaft bearings have been inserted, all carefully fitted, but the idler gear runs on the old stud. I can easily insert three new gears. Would this help?

3—Is it possible to put a new gear on the crankshaft without taking out the shaft?

4—There seems to be a rattle in the universal joint when on a rough road. This noise always has existed. I am going to take this joint out and examine it. How much play should there be?

5—Would a brass or steel bushing cure it, or is the trouble likely to be in the bushing in which the propeller shaft works? A new bushing has been put inside the clutch wheel.—H. R. Ford, Boston, Mass.

1—Evidently the timing gears have become worn and this is causing the noise. Using slightly heavier oil will help to eliminate the noise, but the best and safest remedy is a new set of gears.

2—Yes. We believe the new gears will solve the noise problem.

3—It is not necessary to remove the shaft to replace the timing gear. It is necessary only to remove the radiator and the cover-plate on the timing gear housing and then the gear easily can be taken off and replaced.

4—When the universal joint is new there should be no play in it, except that which would be caused by the 0.001 in. clearance between the universal joint cross and the bushing.

5—In renewing the bushing use the same metal that is used now. If the universal joint has suffered from lack of lubrication the trouble is very apt to be there. A universal joint, working on an angle as it does, is subject to very rapid wear if not lubricated properly. However, if the joint has been well taken care of, it is probable that the bushing in the bearing inside the clutch wheel is worn.

Concerning Various Fuel

Q—What is distillate? How is it made?

2—Is it considered better fuel than coal oil?

3—What is benzol?

4—What is the difference, if any, between the two as a fuel for tractor engine.—W. H. Thompson, Deport, Tex.

1—Distillate is a product made from the residue of petroleum. This crude petroleum as it comes from the ground is led to a still, the still is heated to a temperature of about 125 deg. Fahr., and the lightest portion of the crude petroleum volatilizes. This vapor is condensed and is led off in the form of a very light oil, such as high-test gasoline. Then the temperature of the still is raised and the next lower portion is allowed to vaporize and pass off. This process is continued until a low-grade kerosene is coming from the still. The next product of distillation is distillate. Its vaporizing point will range all the way from 225 to 350 deg. Fahr.

2—Coal oil generally is considered to be kerosene. Distillate is taken from the still after the kerosene has passed off, so it cannot have as low a vaporizing point as coal oil.

3—Benzol is a product of the coke oven industry. The dry distillation of coal first produces coal gas which is used for illuminating purposes. The residue after the coal is coked is mixed with oil, and this mixture is used to wash the gas which is emitted from the oven. This washes out the rich portions of the gas, these dissolving in the mixture and together producing a highly volatile mixture known as benzol.

4—The present engines are not designed to handle benzol properly. Benzol, having more heat units than kerosene and being much more volatile, needs a differently-designed engine.

Engines

Meaning of Advanced Spark

Q—In a discussion concerning the principles of the ignition system in one of our cars, it was claimed that advancing the spark increased its intensity, that is, produced a fatter spark. The writer is under the impression that advancing the spark causes it to occur considerably after the piston has begun its downward stroke, or just at the time it finishes its upper stroke, according to the degree to which the spark is advanced. Is it not sometimes advanced so far when the engine is turning over rapidly that the explosion occurs a trifle before the piston reaches the top of the stroke?—J. A. Roper, Georger Sales Co., Inc., Buffalo, N. Y.

Advancing the spark means shifting the spark lever to such a position that the spark occurs in the cylinders when the particular cylinder under compression has its piston still coming up, that is, ahead of top dead center. Refer to Fig. 9, where is shown a sectional view of a cylinder in which the spark occurs

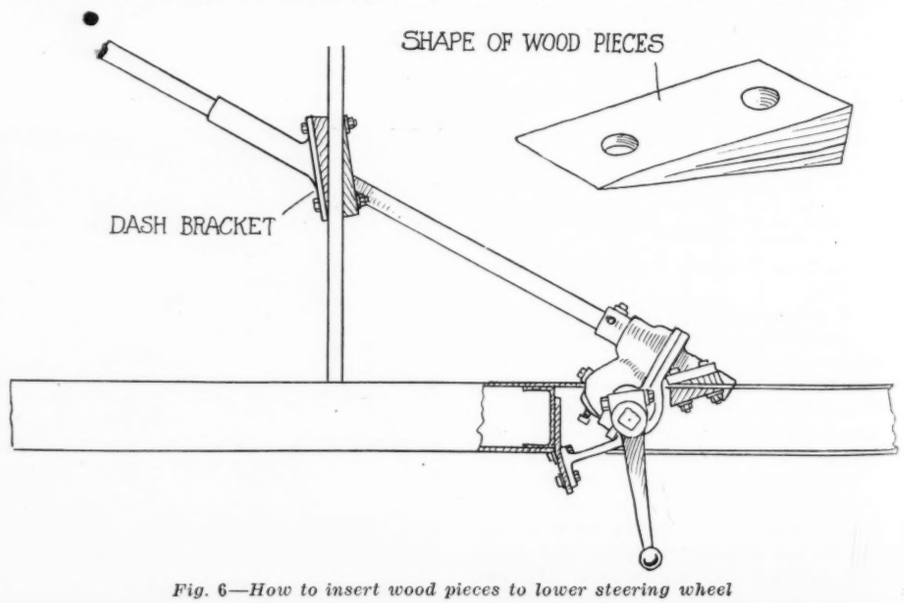


Fig. 6—How to insert wood pieces to lower steering wheel

retarded on center and advanced. The reason for advancing the spark is to give the explosive mixture in the combustion chambers time to ignite. In other words, the explosion does not take place instantaneously, so you have to give the mixture a chance to ignite completely. Thus, when the piston has reached the top dead center and is about to begin its downward course the mixture, with the advanced spark, will have become completely ignited and gets the full impact of the explosion. From this you readily will understand why the spark is retarded on a hard pull or hill, where the engine runs slower. On some high-tension magnetos the intensity of the spark increases with the revolutions per minute of the instrument.

Tapping in Oldsmobile

Q—This eight-cylinder Oldsmobile has what sounds like a valve tap, but mechanics are unable to locate and correct same. Just had main and connecting rod bearings tightened, also new wrist-pins and valves adjusted, but the tap is still there and seems to be in left row of cylinders. When engine is idling this noise, I suppose it is the same, is more heavy, especially when the engine is first started. It is when traveling over 17 m.p.h. or when pulling that the sharp clear sounding tap occurs.—J. Edward Olson, Walla Walla, Wash.

1—A sharp tapping knock can always be attributed to a loose connecting rod. There is another knock which is apt to occur in an engine which is of a tapping nature but it has more of a metallic sound; this is the familiar piston slap. You say that the bearings have been tightened but we are not convinced that the tightening process was done with the greatest of care. It is very possible that the bearing on one of the rods was slightly elliptical and when the bearing was tightened the high side of the rod was the only portion to bear. It would only be a question of a very few revolutions before an adjustment made in this fashion would be out of the adjustment. It is possible by a process of elimination to locate the exact position of the knock as follows: Jack the rear wheels up and apply the emergency brake. Then start the engine and allow it to pull against the brake, running the engine of course at the speed that produces the knock. Now, using an insulated screw-driver, the spark plugs can be short circuited one by one, and if as we believe there is a loose rod, the knock will disappear when the proper cylinder is cut out.

The Sixteen-Valve Stutz

Q—Is the sixteen-valve Stutz engine used in the Bearcat capable of as high speed as the eight-valve Duesenberg engine?

2—Is the Stutz sixteen-valve engine as powerful as the eight-valve Duesenberg of the same size?

3—The Stutz Bearcat is equipped with a 90 m.p.h. speedometer. Would one of these cars attain this speed under favorable conditions? If not, about what should its maximum speed be under best conditions?

4—About what mileage per gallon of gasoline should one expect from this car under ordinary conditions?

5—About how many miles could one of these cars be driven at 45 m.p.h. before the connecting-rod bearings would need adjustment?

6—About how far could it be driven at the same speed before the main bearings would need adjustment, assuming proper lubrication and care in both cases?

7—About what speed should a model 18 Chandler six develop when in best condition and under favorable circumstances?

8—Publish power curves of the Stutz sixteen-valve and the Chandler engines.

9—What is the maximum revolutions per minute of each?—F. A. Work, Tiffin, Iowa.

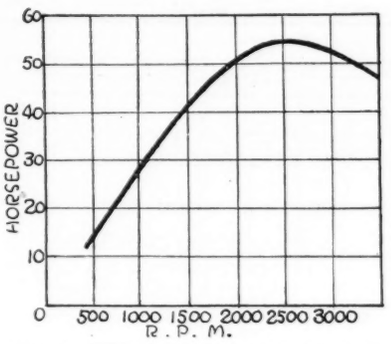


Fig. 7—Power curve of the Chandler engine

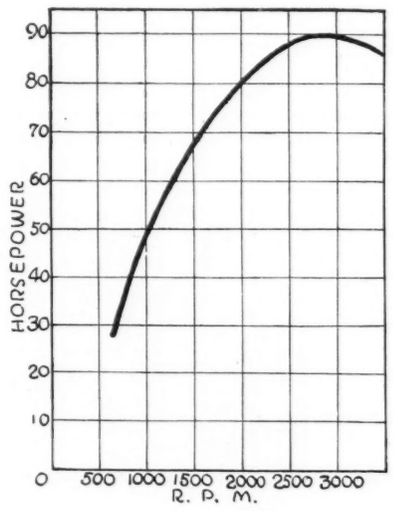


Fig. 8—Power curve of the Stutz sixteen-valve-head engine

1—We do not know the exact r.p.m. of the Duesenberg engine, but it is about 3200 r.p.m. This is the four-cylinder aviation engine with valves operated through the side rods. This engine is geared down through a reduction gear at its front end. The Stutz engine is not quite so fast, turning over about 2800 r.p.m.

2—The Stutz engine develops about 90 hp., while the Duesenberg engine develops about 125 hp.

3—Under favorable conditions and on a track of good road the car should attain a speed very close to 90 m.p.h.

4—The gasoline mileage is dependent upon several things, the kind of driving, the condition of the engine, the tires and brakes, and everything must be in good condition. Then a car of this type should get about 12 to 14 m.p.h.

5—This is a question that cannot be answered satisfactorily because every condition that the car is subjected to is different and this reflects itself in the life of the bearings. If considerable driving is done in a dusty country, then the bearings will wear very rapidly. If the driving is done by a careless driver, then the rear main bearing of the engine is apt to wear out in a hurry. We have known of new engines having to have the bearings taken up after 100 miles travel, and then again there is a certain Reo car we have in mind that has been driven over 50,000 miles and the bearings never have been looked at.

6—See 5.

7—Chandler touring car under good conditions should be able to make about 60 m.p.h.

8—The power curves of these engines are in Figs. 7 and 8. The figures are not absolutely exact because they do not represent average taken from a number of engines.

9—We do not know the maximum engine r.p.m., but the maximum power with its corresponding speed is shown in the power curves.

Sixteen-Valve Head for Fords

Q—Are sixteen-valve cylinder heads advisable for a Ford engine to be used as a fast sport car?

2—Is the upkeep much greater?

3—What company makes the sixteen-valve cylinder heads?

4—Are aluminum pistons and connecting rods advisable?

5—Publish a sketch of a snappy sport body for a Ford chassis with exhaust pipe running alongside and with detachable fenders and one-man top, seat for two in front and an inclosed seat in rear. Show it with top on and with top off.

6—Where can such a body be built and at about what cost?

7—Give address of a firm in Los Angeles that issues a catalog for Ford supplies?—Claude L. Robinson, Pearl Harbor, T. H.

1—The sixteen-valve head attachment for Fords is designed primarily for fast work. It increases the volumetric effi-

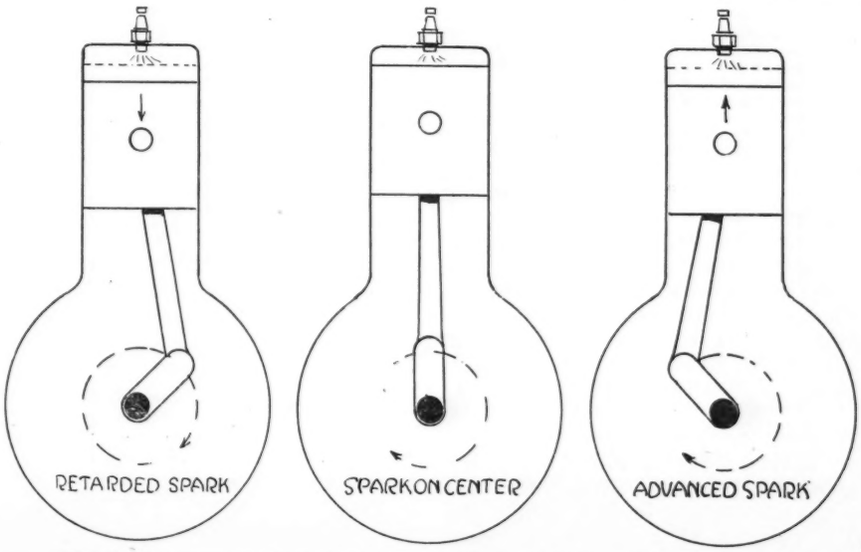


Fig. 9—Diagram to show what is meant by retarded and advanced spark

ciency of the Ford engine. It gives the advantage of overhead valves and also increases the power of the engine about 20 per cent, it is claimed.

2—No. Actual tests on these attachments prove that the engine is very economical with this attachment.

3—The Laurel Motors Corp., Anderson, Ind., and the Craig-Hunt Mfg. Co., Indianapolis, Ind., make these sixteen-valve cylinder heads for Fords.

4—Aluminum pistons when properly fitted add much to the performance of the engine. They reduce the vibratory forces in the engine and consequently permit of higher speeds.

5—MOTOR AGE has printed from time to time attractive designs of Ford speedsters and race cars. Rather than add another design to the long list of designs we advise that you look through some recent copies of MOTOR AGE and pick out one of the designs.

6—Special bodies can be had from the following manufacturers: Auto Body Co., Lansing, Mich.; Briggs Carriage Co., Amesbury, Mass.; Dayton Body Co., Dayton, Ohio.

7—We have no address of a Los Angeles firm in this business.

Piston Clearance Illustrated

Q—Assume that in fitting new oversize iron pistons to re-bored cylinders a piston clearance of 0.002 in. is recommended, does this mean a clearance of 0.002 in. all around, or does it mean that the diameter of pistons should be 0.002 in. less than the diameter of the cylinders?—C. B. Robinson, Orlando, Fla.

Piston clearance is measured by the difference between diameters of the piston and the cylinder bore. Thus, the difference in diameter of the piston and the cylinder bore at the skirt of the piston is 0.001 in. for each inch of cylinder bore. This clearance should increase in uniform steps between the piston rings so that the clearance at the top will measure 0.006 in. In Fig. 10 we show a piston clearance diagram.

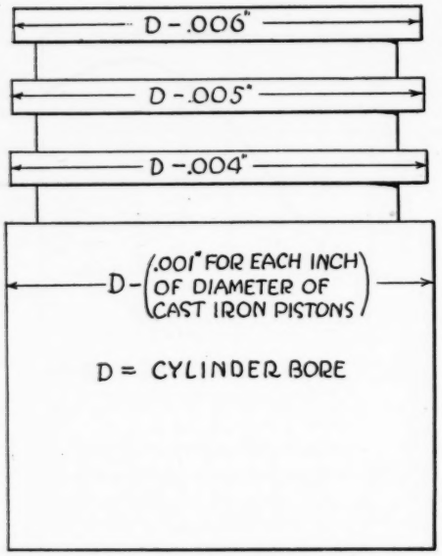


Fig. 10—Diagram of piston clearance

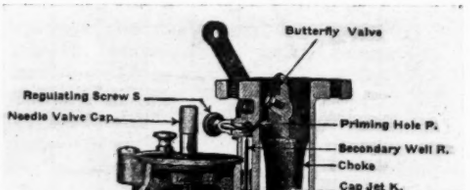


Fig. 11—Zenith carbureter used on Chevrolet 490

Carburetion

Zenith on Chevrolet

Q—Illustrate the operation of the Zenith carbureter on a Chevrolet 490.

2—When I stop I notice a considerable leakage from the carbureter, also when making a slight grade the carbureter sputters and backfires. After backfiring it runs good for a minute or so, then sputters again. I think the carbureter was interfered with when I had my car in the garage to have the carbon taken out, although the repairman denies this. I notice the air thumbscrew has been screwed in about a ¼ in. more than it was.—W. Wilson, Great Falls, Mont.

1—The Zenith carbureter is illustrated in Fig. 11.

2—It is very evident that the regulating screw marked S in the illustration has been tampered with. The position of this screw will not materially affect the operation of the car at high speeds, but at low speeds the action will be very much as you are troubled with at present.

To properly adjust this regulating screw have the engine warm, the spark retarded and the dash control in. Then open the throttle just enough to have the engine running at a moderately slow speed. The present position of the regulating screw no doubt is giving a lean mixture for idling speeds. Turn this screw very slowly so that it comes out, thus increasing the gasoline supply. This will stop the sputtering and backfiring action. As soon as this position is reached the throttle should be advanced rapidly for a moment, and when the engine picks up the correctness of the setting can be determined. If at the instant the engine starts to accelerate there is some backfiring, then the screw should be opened more. This process should be continued until the engine speeds up without missing.

Installing Larger Valves

Q—Publish a diagram of the U. S. L. electric system and Vulcan gearshift as used on the 1914 S. G. V.

2—Where is the S. G. V. made and are they still making them?

3—By installing larger valves is it necessary to have a larger intake manifold?—Joseph Huwiler, San Francisco, Cal.

1—We have no diagram of this system.

2—The S. G. V. car was made by the S. G. V. Co., Redden, Pa., but this company is not in active production now.

3—No. But it is sometimes necessary to use a different carbureter. The use of larger valves permits more mixture to be drawn into the cylinders. The mixture is drawn in during the same interval of time; consequently, its velocity is increased beyond the point where the present carbureter will not work satisfactorily. This is not always the case, for some carbureters are flexible enough to handle this extra air.

Economical Consumption of Gasoline

Q—Do you know of a book published on quality or classification of the various cars manufactured in the United States?

2—What cars are more economical in use of gasoline, upkeep and stand up better after years of service, the four- or six-cylinder cars? From a catalog of some five years back they at that time claimed the sixes were longer lived and more economical in gasoline. Later inquiries of mechanics around garages give me the impression that four-cylinder cars consume less gasoline.

3—Is there any value to these gasoline intensifiers, a tablet supposed to have some chemical power to convert every atom of gasoline into a pure blue gas, increasing efficiency 25 to 50 per cent in mileage, also a device fitted to Ford carbureter increasing mileage efficiency 25 to 40 per cent?—L. J. Heffern, Covington, La.

1—The National Automobile Chamber of Commerce publishes a small book listing the cars but they are not classified according to price or quality.

2—All other things being equal, an engine's gasoline consumption is dependent on the piston displacement. Thus, an engine with the same volumetric efficiency,

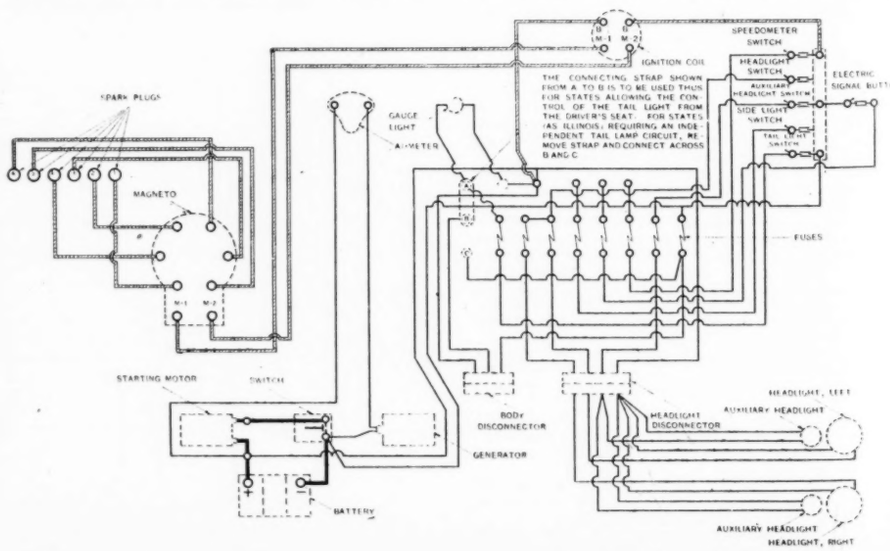


Fig. 12—Wiring diagram of electric system on the Packard six-cylinder

the same carbureter and the same in every other respect but having two times the piston displacement of another will produce two times as much power and will consume two times as much gasoline. As a rule the four-cylinder cars have smaller piston displacements than the six-cylinder cars and are therefore more economical on gasoline.

3—These so-called gasoline fuel savers which are added to the gasoline in tablet form do not increase the power of the gasoline. It is foolish to believe that the addition of a tablet to a tank full of gasoline will add thousands of heat units to each pound of fuel. A gasoline engine is a heat engine pure and simple. For power it is dependent upon the heat in the fuel. These tablets do not add heat units to the gasoline, but some of them have the property of allowing the gasoline to burn more completely within the cylinder, without depositing carbon. For every pound of carbon that is deposited or blown out of the manifold there is lost about 14,000 b.t.u. If this extra heat can be saved, then the gasoline consumption will be reduced.

Thomas Flyer—Model M. C.

Q—What year and what horsepower is a Thomas Flyer model M.C. engine No. 1663?
2—Where can I get parts for this car, especially a waterjacketed intake manifold?
3—What causes these engines to overheat on a heavy pull?—C. E. Tobias, Salt Lake City, Utah.

1—This is a 1912 model, advertised horsepower being 43.

2—E. R. Thomas Co., Buffalo, N. Y.; Puritan Machine Co., Detroit; J. Rosenfeld, 521 Sixth street, Boston, Mass.; these people furnish parts for the Thomas car.

3—It might be that the carbureter is furnishing too rich a mixture and this continues to burn while the exhaust valve is open. There is nothing that will heat up an engine so rapidly as this. A retarded spark will do the same thing. But if this is the case, the engine will not have any power on a hard pull, that is, if the spark is retarded too far. It is always a good policy to retard the spark somewhat when a pull is encountered, to do away with the pounding caused from the pistons slapping. If the spark setting has ever been tampered with, it is probable it is retarded so far as to cause the condition already mentioned. Have you ever had the engine thoroughly cleaned of carbon? Carbon deposits will cause an engine to heat up in a hurry without any apparent cause. Carbon, if coated over the whole of the inside of the cylinder, is not apt to cause pre-ignition, so its presence is rather hard to determine.

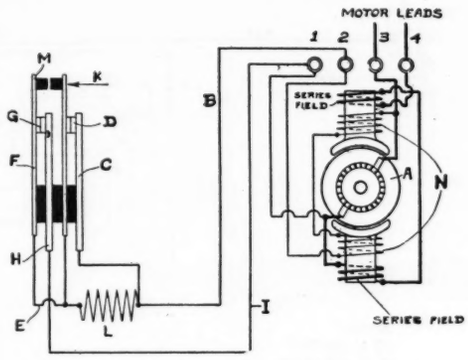


Fig. 13—Meter contacts of the Hudson 6-54 Delco system which inserts resistance in shunt field of generator or open field entirely

Gas Consumption Right

Q—This six-cylinder car, with a bore of 2 13/16 and a Johnson carbureter, will not give more than 17 m.p.g. in ordinary driving, although the carbureter is set for a lean mixture, so lean, in fact, that when starting in a temperature of about 70 deg. there is a tendency to spit back until the engine has run a few minutes and warmed up. After warming up, both power and acceleration are good, and the engine will throttle down to 3 m.p.h. in traffic without missing. I get about 200 m.p.q. of heavy oil and have no carbon or plug troubles under 1500 to 2000 miles. At present the engine is clean, valves ground and adjusted and ignition working as it should. There are no knocks and the engine runs silently and powerfully. It can idle down to a point where the ammeter shows neither charge nor discharge with throttle fully retarded. Is this mileage about right for this setting of carbureter and ordinary driving in city streets, etc?—Howard T. Dimick, Shreveport, La.

For this size engine and city driving 17 m.p.g. is not to be laughed at. Where one makes a long drive and allows the engine to operate under high temperature conditions during the run then more mileage should be expected, probably as high as 22. This would not be unusual. But where stops are frequent and where the engine must be warmed up between times, this mileage of 17 to the gallon that you are getting is about right.

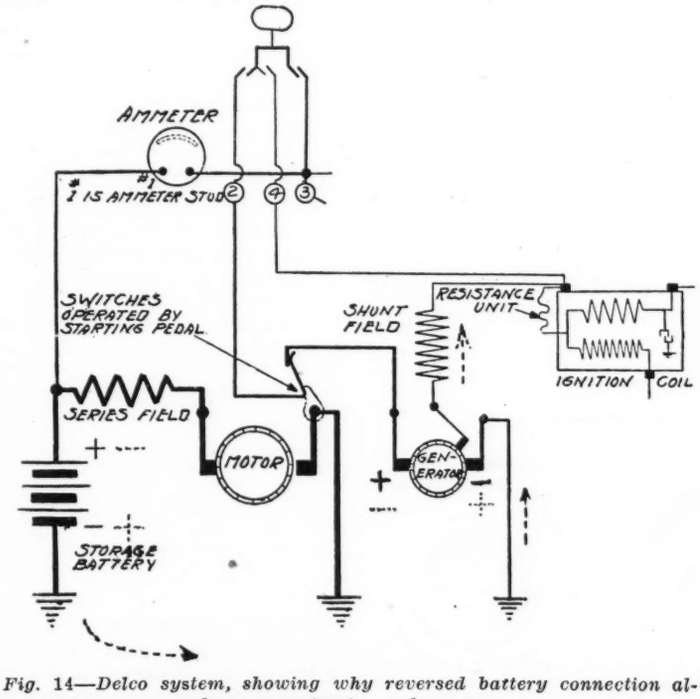


Fig. 14—Delco system, showing why reversed battery connection allows ammeter to read reverse

The Electric System

Packard Wiring Diagram

Q—Publish diagram of the 14-38 Packard six-cylinder car with Delco generator and cut-out and with Bijur regulator with internal connections for both the regulator and generator. —Arthur Henrikson, Chicago.

This is shown in Fig. 12.

Reversed Battery Connections

Q—Why does the ammeter on a Delco system as applied to a motor car show discharge when the generator is running and the battery connected reverse?
2—If this is due to a change of polarity in the generator, what effect will it have upon the battery?
3—Does this hold true in all other systems besides the Delco system?—F. D. Newton, Automobile, Battery & Erectric Service Co., Inc., Joplin, Mo.

1—When the terminals of the battery are reversed it at first thought might be assumed that the voltage of the generator then will add to that of the battery, thus producing a pressure of 12 volts. This, however, is not the case. On the Delco system when the ignition switch is turned on, Fig. 14, the voltage of the battery flows in the direction as the dotted line on the figure indicates. This is in a direction opposite to the normal flow. The result is that the shunt field of the generator builds up in opposite polarity, causing the generator to change its polarity. The operation of the generator when reversed in this manner is not quite the same as it is when its polarity is correct. The voltage produced is not quite as high, and the battery is therefore very apt to suffer injury.

2—See 1.

3—No. Some systems of the double-unit type do not operate in this manner.

Changing Hudson 6-54 System

Q—How can a 24-volt starter on a Hudson 6-54 be changed to a straight 24-volt lamps and starter?
2—How can the charging rate of the generator be increased?—W. W. Bolivar, Floris Auto & Repair Co., Floris, Iowa.

1—This cannot be done on account of the construction of the motor-generator. This is a two-pole motor-generator with a single armature winding, which generates at 6 volts and cranks at 24 volts. Also you would have to change some of the other units of the system. On the cars using this system there is a little catch operated by the magnetic latch which engages the clutch pedal to operate the controller, which changes over the battery connections to the series connections during the cranking operation. When the engine picks up and passes a certain speed, the generator produces a

sufficient voltage to close the cut-out relay and then begins to charge the storage battery as a 6-volt generator.

2—In Fig. 14 are shown the meter contacts which are designed to introduce resistance in the shunt field of the generator when the battery is charging to a certain extent, thus reducing the charging rate and preventing overcharge of the battery, or to open the field circuit entirely, for a similar purpose. These contacts are operated by the large hand on the ampere-hour meter. Their adjustment simply requires that they make good contact and with sufficient pressure between them, in other words, that the contacts are clean and flat and that the blades on which they are mounted have not lost their temper.

If for any reason they are found in such bad condition that their repair does not seem warranted, they should be short-circuited by connecting the No. 1 and 2 battery box terminals together permanently with a heavy copper wire. This will cut the meter contacts out of the circuit entirely. At the same time this is done it will be well to shorten the large meter hand or remove it entirely to prevent a possible ground developing at this point.

Increasing Allis-Chalmers Charging

Q—I have a direct current 110-volt 7-amp. 1-20 hp. type shunt-wound motor. Can same be wired up to run from other power and generate for charging one 6-volt battery? Publish diagram.

2—Is there any way to increase the charging rate on a 1915 Grant six with the Allis-Chalmers starter-generator? I have a car which only charges about four points at 25 m.p.h. What is wrong?—J. H. M. Campbell, Toledo, Ohio.

1—We are illustrating in Fig. 18 a method for using your shunt generator for charging storage batteries. It is not necessary to use lamps for the resistance as we show in the diagram, for standard resistance units may be used instead. However lamps are generally always on hand.

2—The controller mechanism of the Allis-Chalmers system is contained in a cylindrical metal housing above which is carried a spool of resistance wire. From the left end of this resistance spool a wire enters the controller housing and passes through the housing to the outer end of the small connection strap which is fastened to the center end of the fuse. This end of the wire is drawn through this small strap and then is soldered in place. From the right end of the resistance spool another wire enters the controller case and passes through the case to the terminal marked "field." This wire then is wrapped around the field terminal and is soldered. The controller mechanism can be exposed only by removing the solder from the ends of the two wires mentioned, either at the terminal ends of the two wires or the resistance spool ends.

The car speed at which the cut-out closes may be increased by bending the end of the hook in the long blade, so that it holds the end of the spring closer to the blade, and the cut-out speed may be decreased by bending the end of this hook away from the blade. The maximum amperage of the machine, as a dynamo, may be increased by bending the end of the hook on the short blade closer to the blade, and the maximum amperage may be decreased by bending the end of the hook away from the blade so that the spring tension is increased or decreased as required. The resistance which is inserted in the field circuit when the regulator contacts are apart is carried on a spool mounted at one side of the controller base.

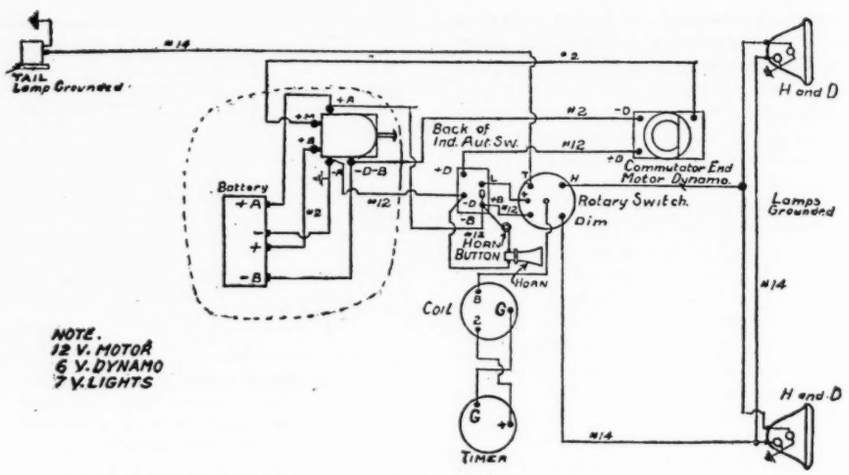


Fig. 16—Wiring diagram of double 6-volt electric system on Sphinx

Double 6-Volt on Sphinx

Q—Publish diagram of the double 6-volt system on 1916 Sphinx car.

2—Explain why one of the 6-volt batteries charges while the other one does not.—Wake & Dixon, Knoxville, Iowa.

1—This diagram is shown in Fig. 16.

2—Double 6-volt systems like this one are very delicate in their operation. The generator produces 6 volts. At the starting switch this pressure is sent half to one of the batteries and the rest to the other battery. If the resistance of one battery increases slightly, such as would be caused by an accumulation of sediment in a cell, then the flow of current will not be evenly divided, the most of it taking the path of least resistance and flowing through the good battery. There may be other reasons for your difficulty. The wires leading to the battery may have a loose connection with its resultant high resistance. This will cause the current as before to flow to the other battery, where the path of resistance is smaller. In any event your difficulty will be found within the section outlined with dotted lines. We advise that you examine the starting switch very carefully and see that there are no loose connections in it.

Reference Books on Generators

Q—Where can I get a book on generator work, winding, etc.—L. S. Billington, Marysville Battery Service Co., Marysville, Kan.

Sheldon & Hausman on Direct Current Machines, published by D. Van Nostrand & Co., New York, and Practical Armature and Magnet Winding by Horstman & Tousley, published by Frederick J. Drake & Co., Chicago, are two good books on generator work.

Changing Delco Starter

Q—What wires should I disconnect in removing the starter from the Delco system on a 1913 Cole?—N. Batinovich, Aberdeen, Wash.

We have been advised by Delco that it is not necessary to disconnect any wires to effect this change. If the starter is not going to be used, then it can be left alone, and the car cranked by hand instead. This will not affect the operation of the unit as a generator.

Magneto Will Not Start Engine

Q—A model 79 T Overland has a Splitdorf low-tension magneto with coil. I ran it for two years without dry cells, always starting easy on the magneto until recently. Suspecting the magnets were weak, I had the magneto overhauled, the work including remagnetizing, new breaker points, etc. Now it is impossible to start on the magneto, although it runs well on the magneto after having been started on dry cells. The magneto repairman says this style of magneto was never intended to start except on dry cells and intimated I was mistaken when I said at one time I never used dry cells. Is he correct?—H. R. Ford, Boston, Mass.

If your magneto once was able to start the engine, then there is no reason why it cannot be made to do the same thing now. The repairman in overhauling the

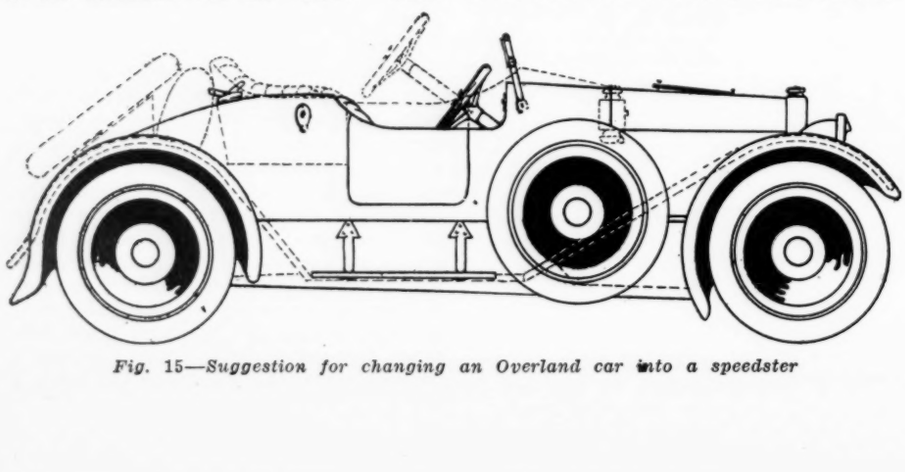


Fig. 15—Suggestion for changing an Overland car into a speedster

magneto, unless he knew his business very thoroughly, probably allowed the magnets to lose their charge. It is no very difficult matter to injure the magnets this way, for simply removing them from the magneto without placing a keeper across the poles will destroy the magnetism immediately. We advise that the magnets be overhauled and recharged so that when tested with a spring balance it will take a pull on the keeper. Also have the breaker points weight of the magnet to dislodge the keeper. Also have the breaker points adjusted for a clearance of 0.020 to 0.022 in.

Driving Generator on Detroiter

Q—I wish to install generator and Jefferson magneto regulator and headlights on a Detroiter A2 direct without using storage battery. I intend to run generator and fan with same belt in the same way as the Maxwell does. Will this prove satisfactory in my car?

2—Would any good generator do the work or would a specially adapted generator be needed? Will it be practical to install generator using say 3-in. pulley on the generator and then test to determine what voltage is developed and use lamp bulbs suitable for the voltage developed?

3—What voltage does the Ford magneto develop when lights are wired in multiple and will the Jefferson regulator take care of all over load in voltage at ordinary driving speeds?—W. S. Colwell, Louisville, Ky.

1—There are several good installations on the market where the generator is driven by the fan belt. Any generator will do the work provided it is run at the proper speed. The best way to do this is to drive the generator from some power take-off at a variable speed, at the same time measuring a voltage output. When this rises to 7 volts determine the speed at that point. This is the cut-in speed of the generator. This speed should be reached when the car is traveling from 8 to 10 m. p. h. in high gear. At the speed of about 10 m. p. h. determine the revolutions of the camshaft. It is a simple question of joining these two speeds together to get the correct size of pulling.

2—See 1.

3—The voltage of the Ford generator varies as the speed. In the March 27 issue we printed a curve which showed the voltage at different engine speeds. The Jefferson regulator is designed to take care of this variation in voltage.

Rebuilding

Wants Ford Speedster Design

Q—Publish a few designs of Ford speedsters?

2—Where can I get special radiators for Fords, the long and narrow type?

3—Explain the method of underslinging the frame of a Ford. Is it advisable to cut the frame to make the rear end hang lower?

4—What is the approximate cost of ready-made speedster bodies?—D. C. Foster, Des Moines, Iowa.

1—We have published designs for Ford speedster bodies from time to time and suggest, if possible, you get hold of back copies of MOTOR AGE wherein have been shown photographs of speedsters built by readers and MOTOR AGE line drawings, which are to be taken as suggestions only. Obviously we cannot go into the details of designing and building a body, as every reader would want something a little different. In the issue of May 29, page 42, was shown a neat-looking Ford speedster built by one of our readers. Perhaps you can get some ideas from this.

2—These are made by the Detroit Radiator & Specialty Co., Detroit; Craig-Hunt, Inc., Indianapolis, Ind.; Laurel Motors Corp., Anderson, Ind., National Can Co., Detroit.

3—A suggestion for doing this was shown in the May 22 issue of MOTOR AGE. You can get special brackets for doing this from the Laurel Motors Corp., Anderson, Ind., and Craig-Hunt, Inc., Indianapolis, Ind.

4—This naturally will vary with whatever concern makes the body. For $125 or so you can get a pretty good looking speedster body for Fords.

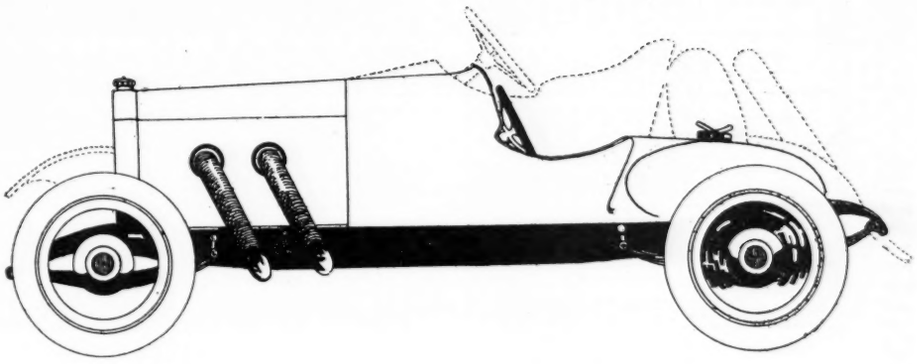


Fig. 17—Suggestion for racing body for application to Overland

Making a Racing Hudson

Q—Publish front and side view of Ira Vail's first Hudson racer which he made from a stock chassis, and give specifications of same.

2—I expect to build a Hudson Super-Six racing car for dirt track work. What length wheelbase should it have?

3—Should I use 32 by 4 or 32 by 4½-in. tires?

4—Can larger valves be put in? What size?

5—How much will they increase my speed?

6—Would the car hold the road better and be better balanced if the engine was set back 6 in. in the frame?

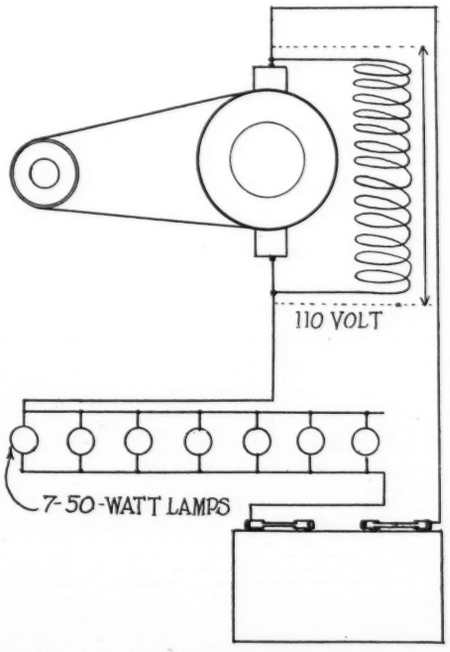


Fig. 18—Method for using shunt generator to charge storge batteries

7—What gear ratio should be used and what speed can be expected of it, the engine being in first class condition and equipped with aluminum pistons?

8—How was Ralph Mulford's stock Hudson geared which made 102 m.p.h. at Sheepshead Bay, also the one that broke the 24-hr. record?—W. A. Lawrence, Chicago.

1—Ira Vail's first Hudson race car was almost identical with the one which he drove in the last Indianapolis race. This was illustrated in the May 29 issue.

2—Most race cars have a wheelbase of 105 in.

3—We advise that you use 32 by 4½-in. tires, although the car driven by Vail had 33 by 5-in. tires.

4—Judging from the information that we have received from the Hudson factory, we do not think it necessary to install larger valves.

5—See 4.

6—No. Shortening the frame so that the wheelbase would be 105 in. makes a close-coupled car that holds the road very well. Witness Vail's Hudson.

7—Change your gear ratio from 4.08, its present value, to 3.00 to 1. With your car equipped with a special race body and a new ring gear and pinion, it would be better than 90 m.p.h.

8—We have not been able to find out the exact ratio of Ralph Mulford's stock Hudson but have been told by race drivers that it was about 3 to 1.

Overland Speedster

Q—Publish suggestion for converting Overland 90 roadster into a speedster.

2—Would you recommend oversize tires?

3—Could I use cantilever springs?—John Leman, Eureka, Ill.

1—See Fig. 15.

2—Yes, for a speedster.

3—According to our information, the Overland model 90 has cantilever springs. If you want to know whether these springs will do for speedster work, yes.

Overland Race Car

Q—Publish sketch of cheap racing body for Overland 75-B. Where can I secure same?

2—What is the highest speed a steam car has been known to make?—Dewey Mauk, Eakly, Okla.

1—A redesigned Overland for fast work is shown in Fig. 17. Special bodies like this are made by the Woodstock Carriage Co., Owensboro, Ky.; Collins Vehicle Woodwork Co., 3900 Chouteau avenue, St. Louis, Mo.; Dayton Body Co., 618 Geyer street, Dayton, Ohio.

2—Marriott in a Stanley steamer, Jan. 23, 1906, made a mile in 31.80 sec., or 113.3 m.p.h.

Motor Age Monthly Guide to Truck Specifications

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
A. & B., 3T	3	.....	48x3½d	48x3½d	Own	4-5 17x4½	Bosch	none	none	Scheb.	none	Own	in-g.	Own	Gem.
A. & B., 5T	5	.....	48x3½d	48x5d	Own	4-5 17x4½	Bosch	none	none	Scheb.	none	Own	in-g.	Own	Gem.
Acason, H	2	.....	36x4	36x7	Wauk.	4-4½x5½	Eise.	Nlite.	Wauk.	Scheb.	Muncie	Muncie	worm	Timkn.	Ross
Acason, L	3½	.....	36x5	36x5d	Wauk.	4-4½x6½	Eise.	Nlite.	Wauk.	Scheb.	Muncie	Muncie	worm	Timkn.	Ross
Acason, M	5	.....	36x6	40x6d	Wauk.	4-4½x6½	Eise.	Nlite.	Wauk.	Scheb.	B.&B.	Cotta	worm	Timkn.	Ross
Acason, R	1	.....	36x3½	36x5	Wauk.	4-3½x5½	Eise.	non	Wauk.	Scheb.	Fuller	Fuller	worm	Timkn.	Ross
Acason, Tractor	6	.....	36x4	36x7	Wauk.	4-4½x5½	Eise.	.....	Wauk.	Scheb.	Muncie	Muncie	worm	Timkn.	Ross
Acason, Tractor	10	.....	36x5	36x5d	Wauk.	4-4½x6½	Eise.	.....	Wauk.	Scheb.	Muncie	Muncie	worm	Timkn.	Ross
Acme, B	1	$1,950	34x3½	34x5	Cont.	4-3½x5	Eise.	G&D	Duplx.	B.&B.	Cotta	Cotta	worm	Timkn.	Ross
Acme, A	2	2,750	36x4	36x7	Cont.	4-4½x5½	Eise.	.....	Duplx.	B.&B.	Cotta	Cotta	worm	Timkn.	Ross
Acme, C	3½	3,650	36x5	40x5d	Cont.	4-4½x5½	Eise.	.....	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Acme, E	5	4,750	36x6	40x6d	Cont.	4-4½x6	Eise.	.....	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Air-O-Flex, 188	2	.....	36x4	36x7	Cont.	4-4½x5½	Eise.	.....	Cont.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
All American, AA	1	1,295	33x4*	32x4	H-S	4-3½x5	A-K	Bijur*	Duplx.	Strom.	Hoosier	B-Lipe	in-g.	Russel	Lavn.
American	2	.....	36x4	36x7	Buda	4-4½x5½	Dixie	none	none	Strom.	B.&B.	G-Lees	in-g.	Torbn.	Ross
American	3½	.....	36x5	36x5d	Buda	4-4½x5½	Eise.	West.	Pierce	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Ross
American	5	.....	36x6	40x6d	Buda	4-4½x6	Eise.	West.	Pierce	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Armleder, HW	2	.....	36x4	36x4d	Cont.	4-4½x5½	Eise.	none	Pierce	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Armleder, KW	3½	.....	36x5	36x5d	Cont.	4-4½x5½	Eise.	none	Pierce	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Atlas, 19	½	1,135	32x4*	32x4*	Lyc.	4-3½x5	Eise.	none	Pierce	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Atterbury, 7R	1½	2,575	36x3½	36x5	Cont.	4-4½x5½	Remy	Remy*	.....	Carter	B-&B.	Own	d-rd.	Hess	Lavn.
Atterbury, 7C	2	2,975	36x4	36x4d	Cont.	4-4½x5½	Eise.	none	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Atterbury, 7D	3½	3,875	36x5	40x5d	Cont.	4-4½x5½	Eise.	none	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Atterbury, 8E	5	4,975	36x5	40x6d	Cont.	4-4½x6	Eise.	none	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Autocar, XXI-F	2	2,050	34x4	34x5	Own	2-4½x4½	Bosch	Delco	Cont.	Zenith*	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Autohorse, 10	5	2,100	34x10	.....	Cont.	4-3½x5	Koko.	none	none	Strom.	Own	Own	d-rd.	Own	Own
Available, 1	1	2,250	36x3½	36x5	Cont.	4-3½x5	Bosch	none	opt.	Strom.	B.&B.	Det.	in-g.	Own	Own
Available, 2	2	2,950	36x4	36x6	Cont.	4-3½x5	Bosch	.....	.....	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Available, 3	3½	4,200	36x5	40x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Available, 5	5	4,900	36x6	40x6d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Beck, A	1	1,550	34x3	34x4	Cont.	4-3½x5	.....	.....	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn.
Beck, B	1¼	1,950	34x3½	34x5	Cont.	4-3½x5	.....	.....	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn.
Beck, C	2	2,250	36x3½	36x6	Cont.	4-	Bosch	.....	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn.
Beech Creek, 3A	3	3,850	36x6	36x6	Wauk.	4-4½x5½	Eise.	.....	Wauk.	King*	B.&B.	Own	bevel	Own	Own
Bessemer, G	1	1,450	34x3½	34x4	Cont.	4-3½x5	Split.	none	none	Zenith	Fuller	Fuller	in-g.	Torbn.	Ross
Bessemer, H	1½	1,945	36x3½	36x5	Cont.	4-3½x5	Split.	opt.	none	Zenith	B.&B.	B-Lipe	in-g.	Torbn.	Ross
Bessemer, J	2	2,490	36x4	36x4d	Cont.	4-4½x5½	Split.	opt.	Pierce	Ray.	B.&B.	B-Lipe	in-g.	Torbn.	Ross
Bessemer, K	3½	3,450	36x5	36x5d	Cont.	4-4½x5½	Split.	opt.	Pierce	Ray.	B.&B.	B-Lipe	in-g.	Torbn.	Ross
Bethlehem, D	1½	1,965	34x3½	34x5	N.A.	4-3½x4½	A-K	G&D*	Mon.	Scheb.	B.&B.	Det.	in-g.	Russel	Lavn.
Bethlehem, E	2½	2,365	34x4	34x6	N.A.	4-4 x4½	A-K	G&D*	Mon.	Scheb.	B.&B.	Det.	in-g.	Russel	Lavn.
Bethlehem, F	3½	3,465	34x4	34x5d	N.A.	4-4½x6	A-K	G&D*	Mon.	Scheb.	B.&B.	Det.	in-g.	Russel	Lavn.
Bourne, VM	2	3,500	36x4	36x8	Herc.	4-4 x5½	Eise.	Entz*	Simplx.	Zenith	Entz	Entz	worm	Timkn.	Ross
Bourne, XM	3½	4,200	36x5	36x10	Herc.	4-4½x5½	Eise.	Entz*	Simplx.	Zenith	Entz	Entz	worm	Timkn.	Ross
Brinton, H	1	1,500	33x4½*	33x4½*	Wis.	4-3½x5	.....	.....	none	.....	.....	.....	worm	.....	.....
Brinton, F	2½	3,000	36x4	36x6	Cont.	4-4½x5½	Bosch	.....	Pierce	.....	.....	.....	worm	.....	.....
Briscoe, 4-24	½	885	31x4*	31x4*	Own	4-3 7/8x5½	Conn.	A-L*	none	Buick	Own	Own	bevel	Own	Own
Briscoe, T-34	1	.....	33x4*	34x4	Own	4-3½x5	Conn.	A-L*	Own	Buick	Own	Own	in-g.	Russel	Lavn.
Brockway, J2	1½	2,450	36x3½	36x5	Cont.	4-3½x5	Eise.	none	none	Scheb.	Hart	B-Lipe	worm	Timkn.	Gem.
Brockway, S	1½	4,850	36x6	40x6d	Cont.	4-3½x5	Eise.	.....	Duplx.	Scheb.	B-Lipe	B-Lipe	worm	Shel.	Gem.
Brockway, K3	2	2,850	36x4	36x7	Cont.	4-4½x5½	Eise.	none	none	Scheb.	Hart	B-Lipe	worm	Timkn.	Gem.
Brockway, R	3½	3,750	36x5	36x5d	Cont.	4-4½x5½	Eise.	none	none	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Brockway, T	5	4,850	36x6	40x6d	Cont.	4-4½x6	Eise.	.....	Duplx.	Car.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Chase, A	1	1,725	36x3½	36x5	Wauk.	4-3½x5½	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Chase, C	1½	2,025	36x3½	36x6	Wauk.	4-3½x5½	Bosch	.....	Mon.	Strom.	B.&B.	Cotta	worm	Shel.	Lavn.
Chase, B	2½	2,475	36x4	36x4d	Buda	4-4½x5½	Bosch	.....	Mon.	Strom.	B.&B.	Cotta	worm	Shel.	Lavn.
Chase, X	3	2,800	36x4	36x5d	Buda	4-4½x5½	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Chase, O	3½	3,000	36x5	36x5d	Cont.	4-4½x5½	Bosch	Dneto.*	Mon.	Strom.	B-Lipe	B-Lipe	worm	Salsby.	Lavn.
Chevrolet, T	1	.....	31x4*	32x4	Own	4-3½x5½	Remy	A-L*	Mon.	Strom.	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Clydesdale, 45	1½	.....	36x3½	36x5	Cont.	4-4½x5½	Lau.	.....	Own	Zenith	Own	Warner	worm	Ind.	Warn.
Clydesdale, 65	2	.....	36x4	36x4d	Cont.	4-4½x5½	Bosch	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Clydesdale, 90	3½	.....	36x5	40x5d	Cont.	4-4½x5½	Bosch	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Clydesdale, 120B	5	.....	36x5	40x6d	Cont.	4-4½x6	Bosch	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Collier, 16	1¼	$1,375	33x4½*	33x4½*	Lyc.	4-3½x5	Conn.	A-L*	.....	Zenith	B.&B.	G-Lees	worm	Chego.	Dtw.
Columbia, F	1	1,750	32x3	32x4	Cont.	4-3½x5	Dixie	.....	Pierce	Shake.	B.&B.	Covert	in-g.	Russel	Own
Gabriel, F	4	4,300	36x5	40x6d	Buda	4-4½x6	Bosch	L-N*	Duplx.	Ray.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Garford, 75-C	1	2,500	34x4½*	36x4	Buda	4-3½x5½	Split.	West.	Duplx.	Ray.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Garford, 66-B	1½	3,000	36x3½	36x5	Buda	4-3½x5½	Split.	West.	Duplx.	Ray.	B-Lipe	Own	worm	Timkn.	Ross
Garford, 70-B	2	3,300	36x4	36x7	Buda	4-4½x5½	Split.	West.	Duplx.	Ray.	B-Lipe	Own	worm	Timkn.	Ross
Garford, 77-C	3½	4,300	36x5	40x5d	Buda	4-4½x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Garford, 68	5	5,000	36x6	40x6d	Wis.	4-4½x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	Own	worm	Timkn.	Ross
Garford, 69	6	5,300	36x6	40x7d	Wis.	4-4½x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	Own	chain	Own	Ross
Garford Trac., 70-B	4½	3,400	36x4	36x7	Buda	4-5 7/8x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	Own	chain	Own	Ross
Garford Trac., 77	7	4,400	36x5	40x5d	Wis.	4-4½x5½	Split.	West.	Duplx.	Ray.	B-Lipe	Own	worm	Timkn.	Ross
Gar. Trac., 68	10	5,100	36x6	40x6d	Wis.	4-4½x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	Own	worm	Timkn.	Ross
Gary, F	1	.....	36x3½	36x4	Cont.	4-3½x5	Eise.	Vesta	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Gary, G	1½	.....	36x3½	36x5	Buda	4-4½x5½	Eise.	Vesta	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Gary, H	2	.....	36x4	36x6	Buda	4-4½x5½	Eise.	Vesta	Simplx	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Gary, HU	2½	.....	36x4	36x7	Buda	4-4½x5½	Eise.	Vesta	Simplx	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Gary, K	3½	.....	36x5	36x5d	Buda	4-4½x6	Eise.	Vesta	Duplx.	Strom.	WG Co.	WG Co.	worm	Shel.	Lavn.
Gem	½	675	31x4*	31x4*	G.B.S.	4-3½x4½	Conn.	Dneto.*	.....	Car.	B.&B.	G-Lees	bevel	W-W.	Fost.
Geneva, 1	½	.....	34x2	36x2½	Beav.	2-5½x4½	Simms	.....	.....	Scheb.	Warner	.....	chain	Shel.	.....
Giant, 15	1	1,850	34x3½	34x5	Cont.	4-3½x5	Eise.	Det.	.....	Scheb.	WG Co.	WG Co.	worm	Timkn.	Jacx.
Giant, 14	1½	2,400	34x3½	34x5	Cont.	4-3½x5	Eise.	Det.	.....	Scheb.	WG Co.	WG Co.	worm	Timkn.	Jacx.
Giant, 16	2	2,850	36x4*	36x7*	Cont.	4-4½x5½	Eise.	Det.	.....	Scheb.	WG Co.	WG Co.	worm	Timkn.	Jacx.
Giant, 17	3½	3,850	36x5	36x5d	Cont.	4-4½x5½	Eise.	Det.	Pierce	Strom.	WG Co.	WG Co.	worm	Timkn.	Ross
Globe, A	1	1,490	34x3½	34x4	Cont.	4-3½x5	Eise.	.....	Pierce	Mast.	B.&B.	Cover	in-g.	Clark	Lavn.
Globe, B	1½	1,850	36x3½	36x5	Cont.	4-3½x5½	Eise.	.....	Pierce	Mast.	B.&B.	Cover	in-g.	Shel.	Lavn.
Globe, C	2	2,190	36x4	36x6	Cont.	4-4½x5½	Eise.	.....	Pierce	Mast.	B.&B.	Cover	in-g.	Clark	Lavn.
G. M. C., 16	½	1,495	35x5*	35x5*	Cont.	4-3½x5	Eise.	.....	Mon.	Own	Own	bevel	Own	Own	Own
G. M. C., 21	1	2,025	34x3½	34x5	Cont.	4-3½x5	Fise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Lavn.
G. M. C., 31	1½	2,295	36x3½	36x5	Cont.	4-3½x5	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Lavn.
G. M. C., 41	2	2,725	36x4	36x4d	Cont.	4-4½x5½	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Lavn.
G. M. C., 71	3½	3,750	36x5	40x5d	Cont.	4-4½x5½	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Lavn.
G. M. C., 101	5	4,350	36x6	40x6d	Cont.	4-4½x5½	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Lavn.
Gramm-B., W	1½	1,895	36x3½	36x5	Cont.	4-4½x5	N. E.	.....	none	Strom.	Fuller	Fuller	in-g.	Clark	Ross
Gramm-B., W	2	2,750	34x4	34x3½d	Wauk	4-3½x5½	Eise.	.....	Wauk.	Zenith	Own	Own	worm	Shel.	Ross
Gramm-B., W	2½	3,350	36x4	36x4d	Wauk	4-4½x5½	Eise.	.....	Wauk.	Zenith	Own	Own	worm	Shel.	Ross
Gramm-B., W	3½	4,000	36x5	40x5d	Wauk	4-4½x5½	Eise.	.....	Wauk.	Zenith	Own	Own	worm	Shel.	Ross
Gramm-B., W	5	5,000	36x6	40x6d	Wauk	4-4½x6½	Eise.	.....	Wauk.	Zenith	Own	Own	worm	Shel.	Ross
Grant, 12	½	1,125	32x4*	32x4*	H-S.	4-3½x5	Dixie	Bijur*	none	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Ditw.
Grant, 10	1½	1,885	34x4½*	34x5	Cont.	4-3½x5	Dixie	Remy*	Pierce	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Jacx.
Grant, 11	1½	1,935	34x4½*	34x5	Cont.	4-3½x5	Dixie	Remy*	Pierce	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Jacx.
Grant, 15	2	2,150	34x4	34x6	Cont.	4-3½x5	Dixie	Remy*	Pierce	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Jacx.
Grant, 16	2	2,250	34x4	34x6	Cont.	4-3½x5	Dixie	Remy*	Pierce	Car.*	B.&B.	G-Lees	in-g.	Torbn.	Jacx.
Hahn, G	1	1,375	34x3	34x4	Cont.	4-3½x5	Eise.	.....	.....	Strom.	Det.	Det.	in-g.	Torbn.	Lavn.
Hahn, C	1½	1,950	36x3½	36x5	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Hahn, E	2½	2,500	36x4	36x4d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Hall	2	2,675	36x4	36x4d	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Hall	3½	3,500	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Hall	5	4,500	36x5	40x6d	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Hall	7	4,500	36x5	40xod	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	chain	Timkn.	Gem.
Harvey, WEA	1½	2,250	34x3½	34x5	Buda	4-4½x5½	Bosch	none	Mon.	Zenith	Fuller	Full r	worm	Shel.	Ross
Harvey, WFA	2½	3,000	36x4	36x7	Buda	4-4½x5½	Eise.	.....	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Harvey, WHA	3½	3,900	36x5	36x5d	Buda	4-4½x6	Eise.	.....	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Harvey, WKA	5	5,000	36x6	40x6d	Buda	4-4½x6	Eise.	.....	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Harvey Trac., HT	10	4,000	36x5	36x5d	Buda	4-4½x6	Eise.	West.*	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Hawkeye, K	1½	1,900	34x3½	34x5	Buda	4-3½x5½	Eise.	Vesta	Simplx	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Hawkeye, M	2	2,650	36x4	36x6	Buda	4-4½x5½	Eise.	Vesta	Simplx	Zenith	Fuller	Fuller	in-g.	Clark	Gem.
Hendrickson	2	2,850	36x4	36x4d	Wauk.	4-4½x5½	Dixie	.....	Wauk.	Strom.	Fuller	Fuller	in-g.	Clark	Gem.
Hendrickson	3½	3,600	36x5	36x5d	Wauk	4-4½x5½	Dixie	.....	Wauk.	Strom.	Fuller	Fuller	worm	Timkn.	Ross
Higrade, A17	¾	1,850	35x5*	35x5*	Cont.	4-3½x5	Simms	L-N.*	Simplx	Zenith	Fuller	Cotta.	worm	Timkn.	Ross
Higrade, A18	1	2,100	35x5*	35x5*	Cont.	4-3½x5	Simms	L-N.*	Simplx	Zenith	Fuller	Fuller	worm	Shel.	Lavn.
Hoover, 15-B	1	1,435	32x4*	33x4½*	Cont.	4-3½x5	Split.	none	.....	Scheb.	Fuller	Fuller	worm	Shel.	Lavn.
Huffman, C	1½	1,495	34x3½	34x3½	Cont.	4-3½x5	Dixie	.....	.....	Zenith	Fuller	Full r	worm	Torbn.	Lavn.
Huffman, B	1½	1,695	34x3½	34x3½	Cont.	4-3½x5	Dixie	.....	.....	Zenith	Fuller	Fuller	worm	Chgo.	Lavn.
Hupmobile	½	1,350	33x4*	33x4*	Own	4-3½x5½	A-K.	West.	.....	Strom.	Own	Own	s-bev.	Own	Jacx.
Hurlburt	2	3,500	36x4	36x4d	Buda	4-4½x5½	Eise.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	.....
Hurlburt	3½	4,250	36x5	36x5d	Buda	4-4½x6	Eisc.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	.....
Hurlburt	5	5,250	36x5	40xtd	Buda	4-4½x6	Fise.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	.....

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Beav., Beaver. **Ignition**—Eise., Eisemann A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West., Westinghouse; L-N, Leece-Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx., Simplex; McCan., McCanna; Rugles, Ruggles. **Carbureter**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter, Flech. Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming; W.G. Co., Warner Gear Co. **Gearset**—B-Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H, Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury; Ind., Industrial; Chgo., Chicago-Standard; Chgo., Chicago; W-W., Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Make of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
Columbia, E	2	2,350	36x4	36x6	Cont.	4-4½x5½	Split.	Vesta	Pierce	Shake.	Hart	Covert	in-g.	Russel	Own
Columbia, T	6	2,350	36x4	36x6	Cont.	4-4½x5½	Split.	Vesta	Pierce	Shake.	Hart	Covert	in-g.	Russel	Own
Comet	1½	1,750	34x4	34x4	Lyc.	4-3½x5	Delco	Dneto.	.....	Carter	B.&B.	Muncie	worm	Chcgo.	CAS.
Commerce, E	1	1,500	34x3	34x4	Cont	4-3½x5	Split.	Bijur*	none	Zenith*	Det.	Det.	in-g.	Torbn.	Jacx.
Commerce, EP	2	1,895	36x6	36x6	Cont.	4-3½x5	Split.	Bijur*	none	Zenith*	Det.	Det.	in-g.	Torbn.	Own
Concord, A	1½	2 550	36x3½	36x5	Buda	4-3½x5½	Eise.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Concord, B	2½	3,000	36x4	36x4d	Buda	4-4½x5½	Eise.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Corbitt, E	1	2,000	34x3½	34x4	Cont.	4-3½x5	Eise.	Disco*	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Corbitt, D	1½	2,400	36x3½	36x5	Cont.	4-3½x5	Eise.	Disco*	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Ross
Corbitt, C	2	3,000	36x4	36x7	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Corbitt, B	2½	3,200	36x4	36x7	Cont.	4-4½x5½	Fise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Corbitt, A	3½	4,000	36x5	36x5d	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	H-Shaw	Cotta	worm	Sncl.	Ross
Corbitt, AA	5	4,500	36x6	40x6d	Cont.	4-4½x6	Fise.	none	Pierce	Strom.	H-Snaw	Cotta	worm	Shel.	Ross
Corliss, A	½	800*	31x4*	31x4*	Mil.	4-3½x4½	Split.	.....	.....	.....	.....	.....	bevel	.....	.....
Couple-Gear, HO	3½	6,000	36x4d	36x4d	Cont.	4-4½x6	Eise.	. . .	. . .	Strom.	.....	.....	bevel	Own	Own
Couple-Gear, AO	5	6,600	36x5d	36x5d	Wis.	4-5½x7	Fise.	.....	.....	Strom.	.....	.....	bevel	Own	Own
Croce, 17	½	825	32x4*	32x4	Wis.	4-3½x5	Bosch	.....	.....	Zenith	B-Lipe	B-Lipe	bevel	Timkn.	Lavn.
Dart, E	1	2,100	34x3½	34x5	Dart	4-3½x5½	Eise.	Bijur*	none	Zenith*	Fuller	Fuller	worm	Timkn.	Ross
Dart, CC4	2	2,950	36x4	36x7	Buda	4-4½x5½	Eise.	Bijur*	Pierce	Zenith	Fuller	Fuller	worm	Timkn.	Ross
Dart, L	3½	4,000	3ox5	36x10	Buda	4-4½x6	Eise.	Bijur*	Pierce	Zenith	WG Co.	WG Co.	worm	Timkn.	Ross
D-E, J	½	1,050	33x4*	33x4*	LeR	4-3½x4½	Berl.	Al-Ch*	.....	Scheb.	Det.	Det.	worm	Shel.	Gem.
D-E A	1	1,775	34x3	34x4	Cont.	4-3½x5	Berl.	.....	.....	Zenith	B.&B.	Covert	worm	Wis.	Ross
D-E, B	1½	2,075	34x3½	34x5	Cont.	4-3½x5	Berl.	.....	.....	Zenith	B.&B.	Covert	worm	Wis.	Ross
D-E, D	2	2,450	36x4	36x6	Cont.	4-4½x5½	Berl.	.....	.....	Zenith	B.&B.	Covert	worm	Wis.	Ross
D-E, C	2½	2,750	36x4	36x7	Buda	4-4½x5½	Berl.	.....	Mon.	Zenith	B.&B.	Covert	worm	Wis,	Ross
D-E, F	5	4,500	36x5	40x6d	Buda	4-4½x6	Berl.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
D-E, F	3½	3,350	36x5	36x5d	Cont.	4-4½x5.	Berl.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Wis.	Ross
Defiance, B	1½	1,795	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	Mon.	Strom.	B.&B.	G-Lee	in-g.	Torbn.	Own
Defiance, C	2	1,995	34x3½	34x6	Cont.	4-4½x5	Eise.	.....	Mon.	Strom.	B.&B.	G-Lee	in-g.	Torbn.	Own
Defiance, D	3½	3,500	36x5	36x5d	Cont.	4-4½x5½	Eise.	.....	Mon.	Strom.	B.&B.	Covert	in-g.	Torbn.	Wol.
DeKalb, E-2	2	2,100	34x3½	3ox5	Cont.	4-4½x5½	Eise.	none	none	Master	Fuller	Covert	worm	Timkn.	Ross
DeKalb, E-2½	2½	2,600	36x4	36x6	Cont.	4-4½x5½	Eise.	none	none	Master	Fuller	Fuller	worm	Timkn.	Ross
Denby, 12	1	1,650	34x3	34x4	Cont.	4-3½x5	Eise.	Bijur*	Mon.	Strom.	Det.	Det.	in-g.	Russel	Ross
Denby, 13	2	2,350	36x3½	36x6	Cont.	4-3½x5	Eise.	Bijur*	Mon.	Strom.	Det.	Det.	in-g.	Russel	Gem.
Denby, 25	3	3,000	36x4	36x7	Cont.	4-4½x5½	Eise.	Bijur*	Mon.	Strom.	Fuller	Fuller	in-g.	Russel	Gem
Denby, 27	3½	4,150	36x5	36x10	Cont.	4-4½x5½	Eise.	.....	Duplx.	Strom.	Own	Warner	in-g.	Clark	Ross
Denby, 210	5	4,900	36x6	40x12	Cont.	4-4½x5½	Eise.	.....	Duplx.	Strom.	Own	WG Co.	in-g.	Clark	Ross
Dependable	1½	.....	34x3½	34x5	Buda	4-3½x5½	Dixie	.....	.....	opt.	.....	.....	worm	.....	Ross
Dependable	2½	.....	36x4	36x7	Buda	4-4½x5½	Dixie	.....	.....	opt.	.....	.....	worm	.....	Ross
Diamond-T, J5	1	2,125	36x3	36x4	Cont.	4-3½x5	Bosch	none	Pierce	Strom.	B-Lipe	B Lipe	worm	Timkn.	Gem.
Diamond-T, J4	1½	2,550	36x3½	36x5	Cont.	4-3½x5	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Diamond-T, J3	2	2,925	36x4	36x7	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Diamond-T, LB	3½	4,150	36x5	36x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Diamond-T, R	5	4,950	36x6	40x6d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	Master	B-Lipe	B-Lipe	chain	Own
Doane	2½	3,500	36x4	36x7	Wauk.	4-4½x5½	Bosch	.....	.....	Strom.	Master	B-Lipe	.....	chain	Own
Doane	6	5,650	36x6	40x6d	Wauk.	4-4½x6½	Bosch	none	Wauk.	Master	B-Lipe	.....	.....	chain	Own
Dorris, K4	2	2,985	36x4	36x7	Own	4-4½x5½	Bosch	West.*	Own	Strom.	WG Co.	WG Co.	worm	Timkn.	Ross
Douglas, TA	1	2,000	34x3½	34x5	Buda	4-4½x5	Eise.	A-L	Pierce	Scheb.*	B.&B.	G-Lees	in-g.	Torbn.	Ross
Duplex, E	3½	4,000	3ox6	36x6	Buda	4-4½x5½	Eise.	opt.	Duplx.	Scneb.*	B-Lipe	B-Lipe	in-g.	Own	Lavn.
Ellsworth, 25A	½	855*	30x3½*	30x3½*	Lyc.	4-3½x5	.....	Dneto.*	none	Carter	Mech.	Mech.	bevel	Gemco	Fost.
Fageol	2	3,300	34x4	36x7	Wauk.	4-4 x5½	Dixie	.....	Wauk.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Fargo, P	2	2,200	36x4	36x6	Cont.	4-3½x5	Bosch	none	Mon.	Ray.	Fuller	Fuller	in-g.	Russel	Jacx.
Federal, S	1	1,900	34x3	34x4	Cont.	4-3½x5	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, T	1	2,350	36x3½	36x5	Cont.	4-4½x5½	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, U	2½	2,600	36x4	36x7	Cont.	4-4½x5½	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, Trac	3	2,500	36x3½	36x5	Cont.	4-4½x5½	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, W	3½	3,350	36x5	36x5d	Cont.	4-4½x5½	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, X	5	4,400	3ox6	40x6d	Cont.	4-4½x5½	Fise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal, Trac	7	3,475	36x5	36x5d	Cont.	4-4½x5½	Eise.	opt.	Mon.	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Forschler	¾	1,535	32x2½	32x3	LeR.	4-3½x4½	Dixie	.....	Mon.	Zenith	Det.	.....	worm	Shel.	Ross
Forschler	1	2,000	34x3	34x4	Cont.	4-3½x5	Bosch	.....	Mon.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Forschler	1½	2,375	34x3½	34x5	Cont.	4-3½x5	Bosch	.....	Mon.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Forschler	2	2,750	34x4	34x6	Contl	4-4½x5½	Bosch	.....	Pierce	Zenith	Fuller	Fuller	worm	Shel.	Ross
Ford, TT	1	550	30x3½*	32x3½	Own	4-3½x4	Own	.....	.....	Own	Own	Own	worm	Own	Own
F.W.D., B	3	4,500	36x6	36xb	Wis.	4-4½x5½	Eise.	.....	Pierce	Strom.	M&E	Cotta	bevel	Own	Ross
Fulton, FX	1½	1,850	34x3½	34x5	H-S	4-3⅜x5⅛	Simms	.....	Pierce	Carter	B.&B.	Own	in-g.	Russel	Lavn.
Gabriel,* C	1	2,000	35x5*	35x5*	Buda	4-3½x5	Bosch	L-N*	none	Ray.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Gabriel, E	2	3,250	36x4	36x7	Buda	4-4½x5½	Bosch	L-N*	Duplx.	Ray.	B.&B.	B-Lipe	worm	Timkn.	Gem.

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Make of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
I. H. C., H	¾	1,550	36x3	36x3½	Own	4-3½x5½	Bosch	N-E.*	Own	Holl.	Own	Own	in-g.	Own	Lavn.
I. H. C., F	1	1,850	36x3½	36x4	Own	4-3½x5½	Bosch	N-E.*	Own	Holl.	Own	Own	in-g.	Own	Lavn.
I. H. C., K	1½	2,200	36x3½	36x5	Own	4-3½x5½	Bosch	N-E.*	Own	Holl.	Own	Own	in-g.	Own	Ross
I. H. C., G	2	2,600	36x4	36x6	Own	4-4 x5	Split.	N-E.*	Own	Ens.*	Own	Own	in-g.	Own	Ross
Independent, F	1	1,485	36x2	36x4	Cont.	4-3½x5	Eise.	Lesco.	Mon.	Marvel	B-Lipe	B-Lipe	worm	Chgo.	Lavn.
Independent, G	2	2,250	36x3½	36x5	Cont.	4-4½x5½	Eise.	none	Mon.	Marvel	.....	.....	worm	.....	.....
Indiana, T	1	2,150	34x3½	34x4	Wauk.	4-3½x5½	Eise.	West.*	Wauk.	Strom.	B.&B.	Covert	worm	Own	Wol.
Indiana, Q	2	2,800	36x4	36x7	Ruten	4-4½x5½	Eise.	West.	Pierce	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
Indiana, D	3½	3,450	36x5	36x5d	Ruten	4-4½x5½	Eise.	West.	Pierce	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
Indiana, R	5	4,600	3ox5	40x6d	Wauk.	4-4½x6½	Eise.	West.	Wauk.	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
Indiana, L															
Jumbo, A	2	.....	36x4	36x7	Buda	4-4½x5½	Eise.	none	Duplx.	Zenith	Fuller	Fuller	in-g.	Clark	Jacx.
Kearns	½	850	30x3½*	30x3½*	Lyc.	4-3½x5	Conn.	Dneto.*	none	Carter	Mech.	Mech.	bevel	Peru	Lavn.
Kearns	1½	1,800	34x3½	34x5	H-S.	4-3½x5	Berl.	none	none	.....	B.&B.	G-Lees	.....	Hayes	.....
Kelly-S., K-31	1½	2,750	36x3½	36x6	Own	4-3½x5½	Eise.	opt.*	Own	Zenith	Own	Cover	chain	Own	Gem.
Kelly-S., K-32	1½	2,750	36x3½	36x6	Own	4-3½x5½	Eise.	opt.*	Own	Zenith	Own	Cover	worm	Own	Gem.
Kelly-S., K-35	2½	3,250	36x4	36x4d	Own	4-3½x5½	Eise.	opt.*	Own	Zenith	Own	Cover	chain	Own	Gem.
Kelly-S., K-36	2½	3,250	36x4	36x4d	Own	4-3½x5½	Eise.	opt.*	Own	Zenith	Own	Cover	worm	Own	Gem.
Kelly-S., K-40	3½	4,250	36x5	40x5d	Own	4-4½x6½	Eise.	opt.*	Own	Ray.	Own	Cover	chain	Own	Gem.
Kelly-S., K-45	4	4,400	36x5	40x6d	Own	4-4½x6½	Eise.	opt.*	Own	Ray.	Own	Cover	chain	Own	Gem.
Kelly-S K-50	5	4,900	36x6	40x6d	Own	4-4½x6½	Eise.	opt.*	Own	Ray.	Own	Cover	chain	Own	Gem.
Kelly-S., K-60	6	5,200	36x6	40x7d	Own	4-4½x6½	Eise.	opt.*	Own	Ray.	Own	Cover	chain	Own	Gem.
Kimball, A	1½	.....	34x3½	34x5	Wis.	4-4 x5	Eise.	opt.	Simplx.	Mast.*	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Kimball, B	2	.....	36x4	36x6	Wis.	4-4 x6	Eise.	opt.	Simplx.	Mast.*	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Kimball, C	2½	.....	36x4	36x7	Wis.	4-4½x6	Berl.	opt.	Simplx	Mast.*	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Kimball, E	4	.....	36x5	40x5d	Wis.	4-4½x5½	Berl.	opt.	Simplx	Mast.*	B-Lipe	B-Lipe	worm	Shel.	Ross
Kimball, F	5	.....	36x6	40x6d	Wis.	4-5 1x5½	Eise.	opt.	Simplx	Mast.*	B-Lipe	B-Lipe	worm	Shel.	Ross
Kissel	1½	2,073	34x3½	34x5	Own	4-3½x5½	Eise.	*	Pierce	Strom.	WG Co.	WG Co.	worm	Shel,	Jacx.
Kissel	2	2,832	34x4	36x7	Own	4-4½x5½	Eise.	*	Pierce	Strom.	WG Co.	WG Co.	worm	Timkn.	Lavn.
Kissel	3½	3,905	36x5	36x5d	Own	4-4½x5½	Eise.	*	Pierce	Strom.	WG Co.	WG Co.	worm	Shel.	Ross
Kissel	5	4,785	36x6	36x6d	Own	4-4½x5½	Eise.	*	Pierce	Strom.	WG Co.	WG Co.	worm	Shel.	Ross
Kleiber, AA	1	2,400	34x3½	34x5	Cont.	4-3½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Kleiber, A	1½	2,650	36x3½	36x6	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Timkn.	Ross
Kleiber, BB	2	2,950	36x4	36x3½d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Shel.	Ross
Kleiber, B	2½	3,500	36x4	36x4d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Timkn.	Ross
Kleiber, C	3½	4,100	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Timkn.	Ross
Kleiber, D	5	5,100	36x6	40x6d	Cont.	4-5½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Timkn.	Ross
Knox, 35	10	5,500	36x4	38x6d	Own	4-5 x5½	Eise.	Bijur.*	none	Zenith*	Own	Own	chain	Timkn.	Ross
Knox, 36	10	6,000	36x4	38x6d	Own	4-5 x5½	Eise.	Bijur.*	none	Zenith*	Own	Own	chain	Timkn.	Ross
Koehler, K	1½	1,450	34x3	34x4	Own	4-3½x5	Eise.	none	Mon.	Strom.	Mech.	Mech	in-g.	Torbn.	Own
Koehler, L	2½	1,985	34x4	34x6	Own	4-3½x5	Eise.	none	Mon.	Strom.	Mech.	Mech.	in-g.	Torbn.	Own
Koehler, M	2½	2,965	36x4	36x7	Own	4-4x5	Eise.	none	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Own
Koehler Trac., KT	3	1,750	34x3	34x5	Own	4-3½x5	Eise.	none	Mon.	Strom.	Mech.	Mech.	in-g.	Torbn.	Own
Koehler, O	3½	3,400	36x5	36x5d	Own	4-4½x5	Eise.	none	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Own
Koehler Trac., LT	5	2,165	34x4	34x6	Own	4-3½x5	Eise.	none	Mon.	Strom.	Mech.	Mech.	in-g.	Torbn.	Own
Koehler, R	5	4,200	36x6	36x6	Own	4-5x6	Eise.	none	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Own
LaFrance, 2-A	2	3,350	36x4	36x7	Cont.	4-4½x5½	Conn.	Dneto.*	Simplx	Zenith	B.&B.	B-Lipe	worm	Timkn.	Ross
Lane, G	1½	2,350	34x4	35x5	Cont.	4-3½x5	Bosch	Dneto.	Pierce	Strom.	B.&B.	Fuller	worm	.....	.....
Lane, H	2½	3,050	34x5	36x7	Cont.	6-3½x5½	Bosch	Dneto.	Pierce	Strom.	B.&B.	Fuller	worm	Timkn.	Ross
Lane, K	3½	3,900	36x5	36x5d	Cont.	6-3½x5½	Bosch	Dneto.	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Ross
Lange, B	2	2,950	36x4	36x6	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	Own	chain	Own	Gem.
Lapeer Trac., 3	3	1,650	34x3½	34x5	Wauk.	4-3½x5½	Dixie	.....	Wauk.	Stew.	Fuller	Fuller	in-g.	Torbn.	Ross
Lapeer Trac., 5	5	2,200	34x3½	34x3½d	Wauk.	4-3½x5½	Dixie	.....	Wauk.	Stew.	Fuller	Fuller	in-g.	Torbn.	Ross
Larrabee, M	1	1,950	34x3½	34x5	Cont.	4-3½x5	Bosch	.....	Pierce	Scheb.	Fuller	Fuller	worm	Shel.	Lavn
Larrabee, C-D	2½	3,000	36x4	36x7	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Larrabee, A	3½	3,950	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Larrabee, T	5	4,750	36x5	40x6d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Lippard-St., C	¾	1,900	35x4½*	35x4½*	Cont.	4-3½x5½	Eise.	Dneto.*	Pierce	Zenith	Hart	B-Lipe	s-bev.	Timkn.	Ross
Lippard-St., H	1	2,250	36x3	36x5	Cont.	4-3½x5½	Eise.	Dneto.*	Pierce	Zenith	Hart	B-Lipe	worm	Timkn.	Ross
Lippard-St., F	1½	2,750	36x3½	36x3d	Cont.	4-4½x5½	Eise.	Dneto.*	Pierce	Zenith	Hart	B-Lipe	worm	Timkn.	Ross
Lippard-St., G	2	3,050	36x4	36x4d	Cont.	4-4½x5½	Eise.	Dneto.*	Pierce	Zenith	Hart	B-Lipe	worm	Timkn.	Ross
L. M. C	2	2,735	36x4	36x4d	Cont.	4-4½x5½	.....	.....	Pierce	Strom.	B.&B	Det.	in-g.	Russel	Lavn.
Lombard, 5	.....	.....	.....	.....	.....	6-5½x7	.....	.....	.....	Strom.	.....	.....	worm	.....	Lavn.
Loyal	¾	835	32x4*	32x4*	H-S.	4-3½x5	A-K.	*	.....	Strom.	B.&B.	Cover	in-g.	Torbn.	.....
Loyal	¾	950	32x4*	32x4*	H-S.	4-3½x5	A-K.	*	.....	Strom.	B.&B.	Cover	in-g.	Torbn.	.....
Maccar, L	1½	2,750	36x4	36x5	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Beav., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nhte, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West., Westinghouse; L-N, Leece-Neville; Det., Detroit; N-E, North East. Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx., Simplex; McCan., McCanna; Rugles, Ruggles. **Carbureter**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfield; King. Kingston; Mon., Monarch Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe, Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming; W. G. Co., Warner Gear Co. **Gearset**—B-Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms. W. G. Co., Warner Gear Co. **Final Drive**—in-g., interna gea , d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H, Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury; Ind., Industrial; Chcgo., Chicago-Standard; Chgo., Chicago; W-W., Walker-We ite Emp., Emp **Steering Gear**—Gem., Gemmer; Lavn. ,Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

Motor Age Monthly Motor Truck Specifications—Concluded

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Make of Engine	No. Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gearset	Final Drive	Axle	Steering Gear
Maccar, H	2½	3,300	36x4	36x4d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Maccar, M	3½	4,100	36x5	36x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Maccar, U	5½	5,000	36x5	40x6d	Wis.	4-5 1x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Mack, AB	1	2,400	36x4	36x3½d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Mack, AB	1	2,400	36x4	36x3½d	Own	4-4 x5	Split.	opt.	Own	opt.	B-Lipe	B-Lipe	chain	Own	Gem.
Mack, AB	1½	2,800	36x4	36x3½d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Mack, AB	1½	2,800	36x4	36x3½d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	chain	Timkn.	Gem.
Mack, AB	2	3,000	36x4	36x4d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Mack, AB	2	3,000	36x4	36x4d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	chain	Own	Gem.
Mack, AB	5	.....	36x4	36x4d	Own	4-4 x5	Split.	opt.	Own	Strom.	B-Lipe	B-Lipe	chain	.....	Gem.
Mack, AC	3½	4,600	36x5	40x5d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	Own	Gem.
Mack, AC	5½	5,250	36x6	40x6d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	Own	Gem.
Mack Trac., AC	7	4,600	36x5	40x5d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	Own	Gem.
Mack, AC	7½	5,500	36x7	40x7d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	Own	Gem.
Mack Trac., AC	11	5,250	36x6	40x6d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	Own	Gem.
Mack Trac., AC	15	5,500	36x7	40x7d	Own	4-5 x6	Split.	opt.	Own	Strom.	Own	Own	chain	Own	Gem.
Manly, 30	1½	2,050	36x4	36x5	Wauk.	4-3½x5½	Eise.	.....	.....	Wauk.	Zenith*	.....	.....	worm	.....	.....
Manly, 40	2	2,350	36x4	36x6	Wauk.	4-3½x5½	Eise.	.....	.....	Wauk.	Zenith*	.....	.....	worm	.....	.....
Manly, 50	2½	2,800	36x4	40x7	Wauk.	4-4 x5½	Eise.	.....	.....	Wauk.	Zenith*	.....	.....	worm	.....	.....
Master, JI	1½	1,990	34x3½	34x5	Buda	4-4½x5½	Eise.	opt.	McCan.	.....	Fuller	Fuller	in-g.	Torbn.	Wol.
Master, JW	1½	2,090	34x3½	34x5	Buda	4-4½x5½	Eise.	opt.	McCan.	.....	Fuller	Fuller	worm	Timkn.	Wol.
Master, M	2	2,390	34x4	36x7	Buda	4-4½x5½	Eise.	West.	McCan.	Mast.	B-Lipe	B-Lipe	in-g.	Torbn.	Wol.
Master, O	2	2,490	34x4	36x7	Buda	4-4½x5½	Eise.	opt.	McCan.	Mast.	B-Lipe	B-Lipe	in-g.	Torbn.	Wol.
Master, W	2	2,590	34x4	36x7	Buda	4-4½x5½	Eise.	West.*	McCan.	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Wol.
Master, WL	2	2,690	34x4	36x7	Buda	4-4½x5½	Eise.	West.*	McCan.	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Wol.
Master, A	3½	3,890	36x5	40x5d	Buda	4-4½x6	Eise.	West.	Pierce	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Master, B	5	4,890	36x6	40x6d	Buda	4-4½x6	Eise.	.....	Pierce	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Maxfer	1	1,195	36x4*	34x4	.....	4-3½x5	Delco	Delco*	.....	.....	.....	.....	worm	.....	.....
Maxwell	1	1,085	32x3	32x4	Own	4-3½x4½	A-K.	A-L.	Own	John.	Own	Own	worm	Own	Own
Menominee	1	1,890	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	Mon.	Strom.	Fuller	Fuller	worm	Timkn.	Gem.
Menominee, H	1½	2,475	36x3½	36x5	Cont.	4-3½x5½	Eise.	.....	Mon.	.....	Fuller	Fuller	worm	Timkn.	Gem.
Menominee, D	2	2,950	36x4	36x4d	Cont.	4-4½x5½	Eise.	.....	Mon.	.....	Fuller	Fuller	worm	Timkn.	Gem.
Menominee, G	3½	3,880	36x5	36x5d	Cont.	4-4½x5½	Eise.	.....	Mon.	Strom.	Fuller	Fuller	worm	Timkn.	Gem.
Menominee, J	5	4,950	36x6	40x6d	Cont.	4-4½x5½	Eise.	.....	Mon.	.....	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Modern, 30	.....	1,800	34x3½	34x5	Cont.	4-3½x5	.....	.....	opt.	Zenith	Fuller	Fuller	worm	Timkn.	Ross.
Moreland, 17-N	1	2,175	34x3½	34x4	Cont.	4-3½x5	Dixie	.....	.....	Miller	Own	Own	worm	Timkn.	Ross.
Moreland, 17-B	1½	2,930	36x3½	36x5	Cont.	4-4½x5½	Dixie	.....	.....	Miller	Own	Own	worm	Timkn.	Ross
Moreland, 17-C	2½	3,775	36x4	36x7	Cont.	4-4½x5½	Dixie	.....	.....	Miller	Own	Own	worm	Timkn.	Ross
Moreland, 17-G	4	4,850	36x5	40x5d	Wauk.	4-4½x6½	Dixie	.....	Wauk.	Miller	Own	Own	worm	Timkn.	Ross
Moreland, 17-J	5	5,250	36x6	40x6d	Wauk.	4-4½x6½	Dixie	.....	Wauk.	Miller	Own	Own	worm	Timkn.	Ross
Muskegon, 20	2	2,325	36x4	36x6	Cont.	4-4½x5½	Eise.	none	Pierce	Stew.	Fuller	Fuller	in-g.	Torbn.	Lavn.
Mutual	2	.....	36x4	36x4d	Wis.	4-4½x6	Bosch	Vesta	Duplx.	Strom.	H-Shaw	Fuller	worm	Wis.	Ross
Mutual	3½	.....	36x5	40x5d	Wis.	4-4½x5½	Bosch	Vesta	Duplx.	Strom.	H-Shaw	Warner	worm	Wis.	Ross
Mutual	5	.....	36x6	40x6d	Wis.	5.1x5½	Bosch	Vesta	Duplx.	Strom,	H-Shaw	Warner	worm	Wis.	Ross
Myers, 50	1	1,495	34x4	34x4	Lyc.	4-3½x5	Delco	Dneto.	Pierce	Car.*	Mech.	Mech.	worm	Emp.	C.A.S.
Myers, 55	1	1,460	34x3½	34x4	Lyc.	4-3½x5	Delco	.....	Pierce	Car.*	Mech.	Mech.	worm	Emp.	C.A.S.
Myers, 70	1½	1,750	34x3½	34x5	Lyc.	4-3½x5	Delco	Dneto.*	Pierce	Car.*	B.&B.	G-Lees	worm	Emp.	C.A.S.
Myers, 75	1½	1,700	34x3½	34x5	Lyc.	4-3½x5	Delco	Dneto.*	Pierce	Car.*	B.&B.	G-Lees	worm	Emp.	C.A.S.
Nash, 2018	1	1,650	34x3	34x4	Own	4-3½x5½	Conn.	A-L.*	Duplx.	Strom.	B.&B.	Det.	in-g.	Clark	Jacox.
Nash, 4017	2	3,250	36x5	36x5	Buda	4-4½x5½	Eise.	Bijur*	Duplx.	Strom.	B.&B.	Own	in-g.	Own	Lavn.
Nash, 3018	2	2,175	34x4	36x5	Own	4-3½x5½	Conn.	A-L.*	Duplx.	Strom.	B.&B.	Det.	in-g.	Clark	Jacox.
Nelson & LeM., F	1	2,000	36x3	36x4	Cont.	4-3½x5½	Eise.	West.*	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Nelson & LeM., F2	2	2,775	36x4	36x7	Cont.	4-4½x5½	Eise.	West.*	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Nelson & LeM., F	3½	3,750	36x5	36x5d	Cont.	4-4½x5½	Eise.	West.*	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Nelson & LeM	5	4,750	36x6	40x6d	Buda	4-4½x6	Eise.	West.*	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Netco, D	2	3,000	36x4	36x6	Cont.	4-4½x5½	Eise.	none	.....	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Niles, B	1	1,500	35x5*	35x5*	Cont.	4-3½x5	Eise.	.....	Pierce	Strom.	Cover	Cover	worm	Timkn.	Gem.
Niles, E	2	2,400	36x4	36x7	Cont.	4-4½x5½	Eise.	.....	Pierce	Strom.	B.&B.	Cover	worm	Timkn.	Gem.
Noble, NW2	2½	2,675	36x4	3ox7	Cont.	4-4½x5½	Eise.	Remy.	Pierce	Strom.	B.&B.	Fuller	worm	Shel.	Ross
Noble, NW4	4	3,750	36x5	36x5d	Cont.	4-4½x5½	Eise.	Remy.	Pierce	Strom.	B.&B.	Fuller	worm	Shel.	Ross
Norwalk, 2000	1	.....	34x4*	34x4*	Lyc.	4-3½x5	Delco	Dneto.*	none	Car.*	B.&B.	G-Lees	worm	Emp.	C.A.S.
Norwalk, 3000	1½	.....	34x4	34x5	Lyc.	4-3½x5	Delco	Dneto.*	none	Car.*	B.&B.	G-Lees	worm	Stand.	C.A.S.
Ogden	1	.....	36x3	36x4	Cont.	4-3¾x5	Bosch	.....	Pierce	Ray.	.....	B-Lipe	worm	Timkn	Gem.
O. K., 1½T	1½	2,450	36x4	36x5	Buda	4-4¼x5½	Eise.	none	Pierce	Zenith	Muncie	Muncie	worm	Chgo.	Ross

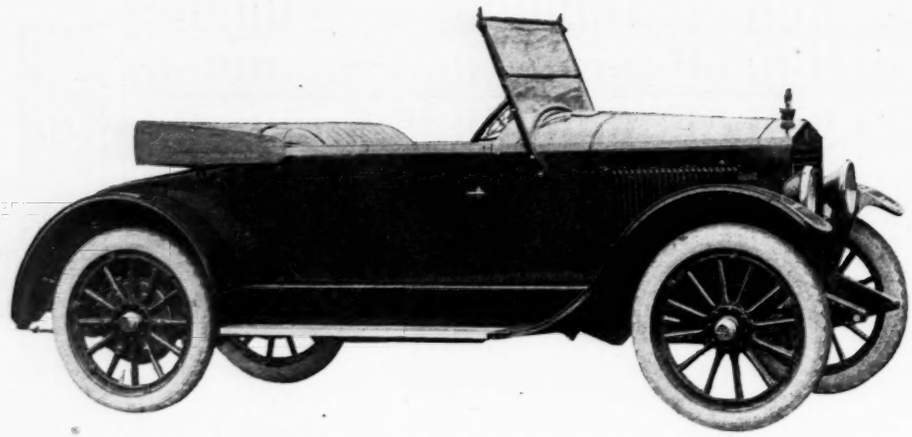
Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Make of Engine	No. Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gearset	Final Drive	Axle	Steering Gear
Royal	5	5,000	36x6	40x6d	Wis.	4-4½x5½	Bosch	opt.*	Mon.	Strom.	H-Shaw	Own	worm	Timkn.	Ross
Royal	6	5,400	36x6	40x6d	Wis.	4-5½x6	Bosch	opt.*	Mon.	Strom.	H-Shaw	Own	worm	Timkn.	Ross
Royal	7	6,500	36x7	40x7d	Wis.	4-5½x7	Bosch	opt.*	Mon.	Strom.	H-Shaw	Own	worm	Timkn.	Ross
Rush, D	½	895	31x4	31x4	Cont.	4-3½x5	Conn.	Split.*	. . .	Carter	B.&B.	.....	bevel	Own	Lavn.
Sandow, G	1	1,795	34x3	34x5	Cont.	4-3½x5	Eise.	.....	.....	Strom.*	Fuller	Fuller	worm	Shel.	Ross
Sandow, CG	1½	2,090	34x3	34x5	Cont.	4-3½x5	Eise.	.....	.....	Strom.*	Fuller	Fuller	worm	Shel.	Ross
Sandow, H	1½	2,375	34x4	34x6	Cont.	4-3½x5	Eise.	.....	.....	Strom.*	Fuller	Fuller	worm	Timkn.	Ross
Sandow, J	2	2,975	36x4	36x7	Cont.	4-4½x5½	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sandow	2	2,650	36x4	36x6	Cont.	4-3½x5	Eise.	.....	.....	Strom.	Fuller	Fuller	worm	Shel.	Ross
Sandow, K	3½	3,995	36x5	36x5d	Cont.	4-4½x5	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sandow, L	5	4,775	36x6	40x6d	Cont.	4-4½x6	Bosch	.....	Cont.	St.om.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sanford, 25	2½	3,000	36x4	3ox4d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B.&B.	Det.	worm	Shel.	Ross
Sanford, 35	3½	3,975	36x5	36x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B.&B.	WG Co.	worm	Shel.	Ross
Sanford, 50	5	4,750	36x5	36x6d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B.&B.	WG Co.	worm	Shel.	Ross
Schacht	2	3,150	36x4	36x7	Buda	4-4½x5½	Bosch	none	Duplx.	Scheb.	Hart	Own	worm	Own	Own
Schacht	2½	3,500	36x4	36x4d	Buda	4-4½x5½	Bosch	none	Duplx.	Scheb.	Hart	Own	worm	Own	Own
Schacht	3½	3,950	36x5	36x5d	Buda	4-4½x5½	Bosch	none	Duplx.	Scheb.	Hart	Own	worm	Own	Own
Schacht	5	4,950	36x5	40x6d	Buda	4-4½x5½	Bosch	none	Duplx.	Scheb.	Hart	Own	worm	Own	Own
Schleicher	3	3,675	34x4½	34x3½d	Cont.	4-4½x5½	Bosch	.....	opt.	Strom.	.....	Own	chain	Own	.....
Schleicher	5	4,725	34x5	34x4d	Cont.	4-5 x6	Bosch	.....	.....	Strom.	.....	Own	chain	Own	.....
Selden, TXR	1	2,000	34x3½	34x5	Cont.	4-3½x5	Bosch	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	in-g.	Russel	Lavn.
Selden, TWL	1	2,200	34x3	34x4	Cont.	4-3½x5	Bosch	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Selden, TXL	1	1,650	34x3½	34x5	Cont.	4-3½x5	Bosch	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	in-g.	Russel	Lavn.
Selden, JCB	2	2,850	36x4	36x7	Cont.	4-4½x5½	Bosch	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	in-g.	Russel	Jacx.
Selden, JWB	2	3,050	36x4	36x7	Cont.	4-4½x5½	Bosch	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Jacx.
Selden, NL	3½	3,850	36x5	36x5d	Cont.	4-4½x5½	Eise.	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn	Ross
Selden, DL	5	5,000	36x6	40x12	Cont.	4-4½x5½	Eise.	N-E*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn	Ross
Seneca, J	½	.....	30x3½*	30x3½*	LeR.	4-3½x4½	Remy	A-Ch.*	none	Scheb.*	Det.	Det.	bevel	Adams	Ditw.
Service, 320	1	2,160	32x3½	34x5	Buda	4-3½x5½	Eise.	West.	none	Strom.*	Fuller	Fuller	worm	Timkn.	Ross
Service, 340	2	3,000	36x4	3ox7	Buda	4-4½x5½	Eise.	West.	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Service, 370	3½	3,900	36x5	36x5d	Buda	4-4½x5½	Eise.	West.*	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Service, 375	3½	4,200	36x5	36x5d	Buda	4-4½x6	Eise.	West.*	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Service, 400	5	5,000	36x6	40x6d	Buda	4-4½x6	Eise.	West.*	Duplx	Strom.	B.&B.	B-Lipe	worm	Timkn.	Ross
Shaw, M-3	2	2,700	36x4	36x6	Cont.	4-4½x5½	Bosch	none	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Signa, F	1	2,400	34x3½	36x5	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signa, H	1½	2,700	34x4	36x6	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signa, J	2	3,100	34x4	36x8	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signa, M	3½	4,100	36x5	40x5d	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signa, R	5	5,100	36x6	40x6d	Cont.	4-4½x6	Eise.	none	.....	Strom	B-Lipe	B-Lipe	worm	Timkn.	Ross
Standard, 76	2	2,800	36x4	36x6	Cont.	4-4½x5½	Eise.	none	Pierce	Scheb.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Standard, 66	3½	3,675	36x5	36x5d	Cont.	4-4½x5½	Eise.	none	Mon.	Strom.*	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Standard, 86	5	4,650	36x6	40x6d	Cont.	4-4½x5½	Eise.	none	Mon.	Strom.*	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Steele, C	2	2,500	38x5	40x4d	Cont.	4-4½x5½	Eise.	.....	Own	Strom.	H-Shaw	Cotta	chain	Own	Ross
Steele, B	3	3,000	38x6	4Cx6d	Own	4-5 x5	Eise.	.....	Own	Strom.	H-Shaw	Cotta	chain	Own	Ross
Steele, BA	4	3,500	38x6	40x5d	Own	4-5 x5	Eise.	.....	Own	Strom.	H-Shaw	Cotta	chain	Own	Ross
Steele, A	5	4,000	38x7	40x6d	Own	4-5 x5	Eise.	.....	Own	Strom.	H-Shaw	Cotta	chain	Own	Ross
Sterling	2½	3,300	36x4	36x4d	Own	4-4½x5½	Eise.	.....	Wauk.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Sterling	3½	4,325	36x5	40x5d	Own	4-4½x6½	Eise.	.....	Wauk.	Ray.*	H-Shaw	Own	worm	Timkn.	Ross
Sterling	5	5,100	36x6	40x6d	Own	4-4½x6½	Eise.	.....	Wauk.	Ray.*	H-Shaw	Own	worm	Timkn.	Ross
Sterling	7	5,600	36x6	40x7d	Own	4-4½x6½	Eise.	.....	Wauk.	Ray.*	H-Shaw	Own	chain	Own	Ross
Stewart, 6	¾	950	33x4*	33x4*	LeR.	4-3½x4½	Eise.	.....	Le Roi	Zenith	Mech.	Mech.	in-g.	Clark	CAS
Stewart, 8	1	1,575	34x3½	34x4	Cont.	4-3½x5	Eise.	.....	Mon.	Zenith	B.&B.	Fuller	in-g.	Clark	Gem.
Stewart, 9	1½	1,975	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	Mon.	Zenith	Fuller	Fuller	in-g.	Clark	Gem.
Stewart, 7	2	2,575	34x4	34x4d	Cont.	4-4½x5½	Eise.	.....	Pierce	Zenith	Fuller	Fuller	in-g.	Clark	Ross
Stewart, 10	3½	3,500	36x5	36x5d	Cont.	4-4½x5½	Eise.	.....	Pierce	Zenith	Fuller	Fuller	in-g	Clark	Ross
Sullivan, F	1½	2,350	36x3	36x5	Buda	4-3¾x4½	Bosch	.....	.....	Strom.	Hart	Covert	worm	Timkn.	Ross
Sullivan, E	2	2,850	36x4	36x6	Buda	4-4½x5½	Bosch	.....	.....	Strom.*	B-Lipe	B-Lipe	worm	Timkn.	Ross
Superior, A	1	1,600	34x3½	34x4*	Own	4-3¾x5	Eise.	none	Mon.	Strom.*	Fuller	Fuller	in-g.	Torbn.	CAS
Superior, C	2	2,200	36x4	36x6	Own	4-3¾x5	Eise.	none	Mon.	Strom.*	Fuler	Fuller	in-g.	Torbn.	Ross
Texan	1½	1,375	34x4*	34x4	Lyc.	.....	.....	.....	.....	Dneto.*	.....	.....	.....	Muncie	worm	Chcgo.	.....
Tiffin, A	¾	1,100	35x4½	35x4½*	Cont.	4-3½x5	Bosch	none	none	Scheb.	Det.	Det.	in-g.	Russe	Lavn.
Tiffin, GW	1½	2,125	36x3½	36x5	Cont.	4-3¾x5½	Bosch	none	Pierce	Scheb.	Fuller	Fuller	worm	Shel.	Ross
Tiffin, MW	2½	2,850	36x4	36x3½d	Cont.	4-4½x5½	Bosch	none	Pierce	Scheb.	Hart	Covert	worm	Timkn.	Ross
Tiffin, PW	3½	3,760	36x5	36x5d	Cont.	4-4½x5½	Bosch	West.*	Pierce	Scheb.	B.&B.	Covert	worm	Shel.	Ross

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Beav., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo: Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West., Westinghouse; L-N, Leece-Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric Starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch: Simplx., Simplex; McCan., McCanna; Rugles, Ruggles. **Carbureter**—Scheb., Schebler; Strom., Stromberg: Ray., Rayfield: King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe, Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming; W. G. Co., Wanaer Gear Co. **Gearset**—B-Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms. **W. G. Co., Warner Gear Co. Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H, Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury; Ind., Industrial; Chcgo., Chicago-Standard: Chgo., Chicago; W-W, Walker-Weiss; En.p., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
O. K., 2T	2	2,650	36x4	36x5	Buda	4-4½x5½	Eise.	none	Pierce	Zenith	Muncie	Muncie	worm	Chgo.	Ross
O. K., 3T	3	3,250	36x4	36x7	Buda	4-4½x5½	Eise.	none	Pierce	Zenith	Fuller	Fuller	worm	Hays	Ross
Old Hickory, M		995	33x4*	33x4*	Lyc.	4-3½x5	Conn.	Dneto.*	.....	Car.	Lyc.	G-Lees	bevel	Salsby	C.A.S.
Old Rel'ble, W-15	1½	2,350	34x3½	36x6	Wis.	4-4 x5	Bosch	opt.	Mon.	Ray.*	B-Lipe	B-Lipe	worm	Shel.	Ross
Old Rel'ble, W-25	2½	3,250	36x4	36x4d	Wis.	4-4½x6	Bosch	opt.	Mon.	Ray.	Fuller	Fuller	worm	Shel.	Ross
Old Rel'ble, W-35	3½	4,000	36x5	36x5d	Wis.	4-4½x5½	Bosch	opt.	Mon.	Ray.	Univ	Savg	worm	Shel.	Ross
Old Rel'ble, W-50	5	5,000	36x6	40x6d	Wis.	4-5.1x5½	Bosch	opt.	Duplx.	Strom.	Univ.	Savg.	worm	Shel.	Ross
Old Rel'ble, C-50	5	5,000	36x6	36x6d	Wauk.	4-4½x6½	Bosch	none	Wauk.	Strom.	Univ.	Savg.	chain	Shel.	Ross
Old Rel'ble, C-70	7	6,000	36x6	40x7d	Wauk.	4-4½x6½	Bosch	none	Wauk.	Strom.	Univ.	Savg.	chain	Shel.	Ross
Oldsmobile	¾	1,250	35x5*	35x5*	Own	4-3½x5½	A-L	A-L	Mon.	Zenith	.....	.....	in-g.	Torbn.	Jacx.
Oneida, A	1	2,290	36x3½	36x5	Cont.	4-3½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta.	worm	Timkn.	Ross
Oneida, B	1½	2,650	36x3½	36x6	Cont.	4-4½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta.	worm	Timkn.	Ross
Oneida, C	2	3,000	36x4	36x7	Cont.	4-4½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta.	worm	Timkn.	Ross
Oneida, D	3½	3,700	36x5	36x5d	Cont.	4-4½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta.	worm	Timkn.	Ross
Oneida, E	5	4,750	3ox6	40x12	Cont.	4-5½x5½	Bosch	West.	Pierce	Strom.	H-Shaw	Cotta.	worm	Timkn.	Ross
Oshkosh	2	3,500	36x6*	36x6*	H-S	4-3½x5	N. E.	N. E.	.....	.....	Zenith	B-Lipe	B-Lipe	bevel	Own	Ross
Overland, Panel		900	31x4*	31x4*	Own	4-3½x5	Conn.	A-L.*	.....	Till.*	Own	Own	bevel	Own	Own
Overland, Exp		900	31x4*	31x4*	Own	4-3½x5	Conn.	A-L,*	.....	Till.*	Own	Own	s-bev.	Own	Own
Overland		1,015	33x4½*	33x4½*	Own	4-4½x4½	Conn.	A-L.*	.....	Till.	Own	Own	worm	Own	Own
Packard, E	1½	3,000	34x3½	34x3½	Own	4-4 x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	2	3,400	34x4	34x4d	Own	4-4 x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	3	4,100	36x5	36x5d	Own	4-4½x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	4	4,450	35x5	40x5d	Own	4-4½x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	5	5,150	36x6	40x6d	Own	4-5 x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E	6	5,400	36x6	40x7d	Own	4-5 x5½	Split.	Bijur*	Own	Own	Own	Own	worm	Own	Own
Paige, 50	2	.....	36x4	36x5	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Jacx.
Paige, 51	3½	.....	36x7	36x5d	Cont.	4-4½x5½	Eise.	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Palmer	1	1,585	34x3½	34x4	Cont.	4-3½x5	Bosch	.....	Pierce	Strom.	Fuller	Fuller	worm	Timkn.	Jacx.
Palmer	2	2,275	36x3½	36x4d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	Fuller	Fuller	in-g.	Torbn.	Ross
Panhard, A	1	1,195	32x3½	32x3½	Gray	4-3½x5	A-L	A-L	.....	Strom.*	Fuller	Fuller	in-g.	Torbn.	Lavn.
Panhard, B	1½	1,395	32x3½	32x4	Gray	4-3½x5	A-L	A-L	.....	Strom.*	Fuller	Fuller	in-g.	Torbn.	Lavn.
Panhard, E	2½	2,350	34x4	34x6	Buda	4-4½x5½	Eise.	opt.	Duplx.	Strom.	Fuller	Fuller	in-g.	Torbn.	Lavn.
Parker	2	3,150	34x4	36x3½d	Cont.	4-3½x5½	Dixie	West.*	Pierce	Strom.	B-Lipe	Own	worm	Own	Ross
Parker	3	3,700	34x4	36x5d	Cont.	6-3½x5½	Dixie	West.*	Pierce	Strom.	B-Lipe	Own	worm	Own	Ross
Parker	4	4,250	36x5	40x5d	Cont.	6-3½x5½	Dixie	West.*	Pierce	Strom.	B-Lipe	Own	worm	Own	Ross
Parker	5	5,000	36x5	40x6d	Cont.	6-3½x5½	Dixie	West.*	Pierce	Strom.	B-Lipe	Own	worm	Own	Ross
Patriot	1½	2,150	34x3½	34x5	Cont.	4-3½x5	.....	.....	.....	Strom.*	.....	.....	.....	.....	.....
Patriot	2½	3,150	34x4	34x7	Cont.	4-4½x5½	.....	.....	.....	Strom.*	.....	.....	.....	.....	.....
Peerless, TC	3	4,125	36x4	40x4d	Own	4-4½x6½	Remy	none	Own	Strom.	Own	Own	chain	Own	Own
Peerless, TC	4	4,150	36x5	40x5d	Own	4-4½x6½	Remy	none	Own	Strom.	Own	Own	chain	Own	Own
Peerless, TC	5	4,700	36x6	40x6d	Own	4-4½x6½	Remy	none	Own	Strom.	Own	Own	worm	Own	Own
Pierce-Ar., X-4	2	3,750	30x4	36x4d	Own	4-4 x5½	Eise.	West.*	Own	Own	Own	Own	worm	Own	Own
Pierce-Ar., R-9	5	5,500	36x6	40x6d	Own	4-4½x6	Eise.	West.*	Own	Own	Own	Own	worm	Timkn.	Ross
Power	2	.....	36x4*	36x4d*	Cont.	4-4½x5½	Simms	.....	Pierce	King	Fuller	Fuller	worm	Timkn.	Ross
Rainier, R-5	¾	1,550	34x4	34x4	Cont.	3-4½x5½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Rainier, R-5	¾	1,250	33x4*	33x4*	Lgt.	4-3½x4½	Simms	none	none	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Rainier, R-2	¾	1,350	34x4*	34x4*	Lgt.	4-3½x4½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Hayes	Lavn.
Rainier, R-4	1½	1,595	33x4*	34x4	Lgt.	4-3½x4½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Chgo.	Lavn.
Rainier, R-6	1½	1,890	34x3	34x4	Cont.	4-3½x5½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Chgo.	Lavn.
Rainier, R-8	2	2,250	34x4	34x6	Cont.	4-3½x5½	Simms	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Hayes	Lavn.
Ren.-Leslie, M	2½	2,895	36x5	36x7	Buda	4-4½x5½	Split.	West.	Pierce	Strom.	Warner	Warner	worm	Hayes	Lavn.
Ren.-Leslie, B	8	2,895	36x5	36x7	Buda	4-4½x5½	Split.	West.	Pierce	Strom.	Warner	Warner	worm	Hayes	Lavn.
Reo, F	¾	1,250	34x4½*	34x4½*	Own	4-4½x4½	Remy	Remy*	none	John.	Own	Own	s-bev.	Own	Own
Republic, Desp	¾	1,095	32x3	32x3½	Own	4-3½x5	Remy	Remy	Rugles	Strom.	Own	Own	in-g.	Torbn.	Jacx.
Republic, 9 Sp	¾	1,295	32x3	32x4	Own	4-3½x5	Eise.	none	Rugles	Strom.	Own	Own	in-g.	Torbn.	Jacx.
Republic, 10	1	1,535	34x3	34x4	Cont.	4-3½x5	Eise.	none	Rugles	Strom.	Fuller	Fuller	in-g.	Torbn.	Jacx.
Republic, 11X	1½	1,885	34x3½	34x5	Cont.	4-3½x5	Eise.	none	Rugles	Strom.	Fuller	Fuller	in-g.	Torbn.	Jacx.
Republic, 19	2	2,395	34x4	34x6	Cont.	4-4½x5½	Bosch	none	Pharo	Strom.	Fuller	Fuller	in-g.	Torbn.	Jacx.
Republic, 20	3½	3,450	30x5	36x5d	Cont.	4-4½x5½	Eise.	none	Pharo	Strom.	Fuller	Fuller	in-g.	Torbn.	Jacx.
Riker, B	3	.....	30x5	36x5d	Own	4-4½x6	Beri.	West.*	Own	Own	Own	Own	worm	Own	Ross
Riker, BB	4	.....	36x5	36x6d	Own	4-4½x6	Berl.	West.*	Own	Own	Own	Own	worm	Timkn.	Ross
Rowe, CDW	2	3,000	34x4	36x7	Wis.	4-4 x5	Bosch	none	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, CDW	2½	3,250	34x4	36x4d	Wis.	4-4 x5	Bosch	none	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, DEW	3	3,800	30x5	36x5d	.....	4-4 x6	Bosch	none	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, GW	3	.....	38x7	42x9	H-S	.....	A-K	West.*	.....	.....	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, FW	5	4,900	36x6	40x6d	Wis.	4-4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Royal	1	2,400	34x4	34x5	Wis.	4-3½x5	Bosch	opt.*	Mon.	Strom.	B.&B.	Own	worm	Timkn.	Ross
Royal	1½	2,800	34x4	34x5	Wis.	4-3½x5	Bosch	opt.*	Mon.	Strom.	B.&B.	Own	worm	Timkn.	Ross
Royal	2	3,200	36x4½	36x6	Wis.	4-4 x6	Bosch	opt.*	Mon.	Strom.	B.&B.	Own	worm	Timkn.	Ross
Royal	2½	3,500	36x4½	36x6	Wis.	4-4½x6	Bosch	opt.*	Mon.	Strom.	B.&B.	Own	worm	Timkn.	Ross
Royal	3½	4,200	36x5	38x5d	Wis.	4-4½x6	Bosch	opt.*	Mon.	Strom.	B.&B.	Own	worm	Timkn.	Ross

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Make of Engine	No. Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carbureter	Clutch	Gearset	Final Drive	Axle	Steering Gear
Tiffin, RW	5	5,000	36x6	40x6d	Cont.	6-3½x5½	Bosch	West.	none	Scheb.	B.&B.	Covert	worm	Shel.	Ross
Tiffin, SW	6	5,200	36x6	40x12	Cont.	6-3½x5½	Bosch	West,*	none	Scheb.	B.&B.	Covert	worm	Shel.	Ross
Titan, T	3½	4,300	36x5	40x5d	Buda	4-4½x6	Bosch	Bosch	Duplx.	Strom.	B.&B.	Cotta	in-g.	Clark	Lavn.
Titan, H	6	5,150	36x6	40x6d	Buda	4-4½x6	Bosch	Bosch	Duplx.	Strom.	B.&B.	Cotta	in-g.	Clark	Lavn.
Tower, F	2	2,975	36x4	36x7	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	Fuller	Fuller	worm	Timkn.	Ross
Tower, G	3½	4,100	3ox5	36x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	Fuller	Fuller	worm	Timkn.	Ross
Traffic	2	1,395	34x3	34x4	Gray	4-3½x5	Koko.	none	none	Carter	B.&B.	Cover.	in-g.	Russe.	Ditw.
Transport, N	5	2,750	34x3½	34x4d	.....	4-3½x5	Bosch	.....	Mon.	Zenith	.....	.....	worm	.....	.....
Triangle, A	1½	2,185	34x3½	34x6	Wauk.	4-3½x5½	Eise.	none	Wauk.	Strom.	Fuller	Fuller	in-g.	Clark	Gem.
Triangle, B	2½	2,850	36x4	36x7	Ruten	4-4½x5½	Eise.	.....	Pierce	Strom.	Fuller	Fuller	in-g.	Clark	Gem
Union, B	2½	2,375	36x4	36x7	Cont.	4-4½x5½	Eise.	none	Duplx.	Scheb.	Fuller	Fuller	in-g.	Russel	Ross
Union, C	4	3,500	36x6	36x5d	Wis.	4-4½x6	Eise.	.....	.....	Scheb.	.....	Fuller	in-g.	Torbn.	.....
U. S., E	2½	2,800	34x4	36x4d	Cont.	4-4½x5½	Eise.	.....	Pierce	Strom.	Hart	Cotta	chain	Own	Lavn.
U. S., H	2½	3,250	34x4	36x4d	Cont.	4-4½x5½	Eise.	.....	Pierce	Strom.	Hart	B-Lipe	worm	Shel.	Lavn.
U. S., D	3½	3,500	36x5	36x5d	Cont.	4-	Eise.	.....	Pierce	Strom.	Hart	B-Lipe	chain	Own	Lavn.
U. S., J	3½	3,950	36x5	40x5d	Cont.	4-4½x5½	Eise.	.....	.....	Strom.	Hart	B-Lipe	worm	Shel.	Lavn.
U. S., K	5	4,850	36x5	40x6d	Wauk.	4-4½x6½	Eise.	.....	Wauk.	Strom.	B.&B.	B-Lipe	worm	Shel.	Lavn.
United, AX	1½	.....	36x3½	36x6	Buda	4-3½x5½	Eise.	opt.	Simplx*	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
United, BX	2½	.....	36x4	36x7	Buda	4-4½x5½	Eise.	.....	Simplx*	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
United, CX	3½	.....	36x5	36x5d	Buda	4-4½x6	Eise.	.....	Simplx*	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
United, VX	5	.....	36x5	40x6d	Buda	4-4½x6	Eise.	.....	Simplx*	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Universal, G	1½	.....	34x3½	34x5	Buda	4-3½x5½	Eise.	.....	Mon.	Zenith	Own	Own	worm	Own	Lavn.
Universal, D	2	.....	36x5	36x4d	Own	4-4½x5½	Eise.	.....	Mon.	Zenith	Own	Own	chain	Own	Lavn.
Universal, L	3½	.....	36x5	36x5d	Buda	4-4½x5½	Eise.	.....	Mon.	Zenith	Own	Own	chain	Own	Lavn.
Velie, 25B	2	2,950	36x4	36x7	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.*	B.&B.	B-Lipe	worm	Timkn.	Gem.
Velie, 26B	3½	3,900	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Vim, 21	½	945	31x4*	31x4*	Own	4-3 x4½	Split.	West.	.....	Zenith	Own	Own	bevel	.....	Jacx.
Vim, 25	1	2,195	34x3½	34x4	Herc.	4-3½x5½	Split.	.....	Duplx.	Zenith	.....	.....	worm	Shel.	Gem.
Vim, 22	2	3,150	36x4	36x6	Herc.	4-3½x5½	Split.	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Gem.
Vim, 23	3	3,950	36x4	36x4d	Herc.	4-4½x5½	Split.	.....	Duplx.	Zenith	.....	B-Lipe	worm	Shel.	Gem.
Walter, MO	3	.....	40x4d	40x4d	Own	4-4½x6	.....	none	Own	Zenith	Own	Own	ext-g.	Own	Own
Walter, F	5	5,700	40x7	40x10	Own	4-4½x6½	Eise.	West.*	Own	H&N	Warner	Own	in-g.	Own	Own
Watson, Tractor	5	4,050	34x4	36x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Weir-Smith	3½	.....	37x7	37x7	Cont.	4-4½x5½	Dixie	.....	.....	Zenith	Fuller	Own	worm	Timkn.	Ross
White, GBBE	¾	2,300	34x4½*	34x4½*	Own	4-3½x5½	.....	.....	none	Own	Own	Own	bevel	Own	Own
White, TBC	1½	3,300	36x4	36x7	Own	4-3½x5½	.....	.....	none	Own	Own	Own	d-rd.	Own	Own
White, TJ	3	4,100	36x5	40x5d	Own	4-3½x5½	.....	.....	none	Own	Own	Own	d-rd.	Own	Own
White, TG	5	5,000	36x6	40x6d	Own	4-4½x5½	.....	.....	none	Own*	Own	Own	d-rd.	Own	Own
White-Hi., H	1½	2,400	36x3½	36x5	Cont.	4-3½x5	Eise.	none	Pierce	Strom.*	Fuller	Fuller	worm	Timkn.	Ross
Wichita, A	1	1,850	36x3	36x4	Own	4-3½x5	Bosch	Bosch	none	Strom.	Own	Cover.	chain	Shel.	Ross
Wichita, K	1	2,000	36x3	36x4	Own	4-3½x5	Bosch	Bosch	none	Strom.	Own	Cover.	worm	Shel.	Ross
Wichita, L	1½	2,350	36x3½	36x5	Own	4-3½x5	Bosch	Bosch	none	Strom.	Own	Cover.	chain	Shel.	Ross
Wichita, B	2	2,500	36x3½	36x6	Own	4-3½x5	Bosch	Bosch	Wauk.	Strom.	Hart.	B-Lipe	worm	Shel.	Ross
Wichita, R	2½	2,950	36x4	36x7	Wauk.	4-3½x5½	Bosch	Bosch	Wauk.	Strom.	Harr,	B-Lipe	worm	Shel.	Ross
Wichita, O	3½	3,750	36x5	36x5d	Wauk.	4-4½x5½	Bosch	Bosch	Wauk.	Strom.	Hart.	B-Lipe	worm	Shel.	Ross
Wichita, Q	5	4,600	38x6	38x6d	Wauk	4-4½x5½	Bosch	Bosch	Wauk.	Strom.	B.&B.	B-Lipe	worm	Shel.	Own
Wilcox, S	1	1,950	35x5*	35x5	Cont.	4-3½x5	Bosch	none	Pierce	Strom.	Own	Own	worm	Shel.	Own
Wilcox, X	1½	2,775	36x4	36x5	Own	4-4½x5	Bosch	none	Pierce	Strom.	Own	Own	worm	Shel.	Own
Wilcox, Q	2½	3,250	36x4	36x3½d	Own	4-4½x5	Bosch	none	Pierce	Strom.	Own	Own	worm	Shel.	Own
Wilcox, P	3½	3,950	36x5	36x5d	Own	4-4½x5	Bosch	.....	Pierce	Strom.	Own	Own	worm	Shel.	Own
Wilcox, W	5	4,850	36x5	40x12	Wauk.	4-4½x6½	Bosch	none	Wauk.	Strom.	B.&B.	Covert	worm	Timkn.	Own
Wilson	1	1,750	35x5*	35x5	Cont.	4-3½x5	Eise.	opt.	Pierce	Marvel	Hart.	Covert	worm	Timkn.	Own
Wilson	2	2,800	36x4	36x7	Cont.	4-4½x5½	Eise.	opt.	Pierce	Strom.	B.&B.	Warner	worm	Timkn.	Own
Wilson	3½	3,800	36x5	36x5d	Cont.	4-4½x5½	Eise.	opt.	Mon.	Strom.	B.&B.	Warner	worm	Timkn.	Ross
Wilson	5	4,600	36x6	40x6d	Cont.	4-4½x5½	Eise.	opt.	Mon.	Strom.	B.&B.	Warner	worm	Timkn.	Ross
Winther, 39	1½	2,150	34x3½	34x5	Wis.	4-3½x5	Eise.	Bijur*	Simplx.	Strom.	Fuller	Fuller	in-g.	Clark	Lavn.
Winther, 49	2	3,000	36x4	36x4d	Wis.	4-4 x6	Eise.	Bijur*	Simplx.	Mast.*	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 69	3	3,800	36x5	36x5d	Wis.	4-4 x6	Eise.	Bijur*	Simplx.	Mast.*	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 89	4	4,200	36x5	40x5d	Wis.	4-4½x6	Eise.	Bijur*	Simplx.	Mast.*	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 109	5	5,000	36x6	40x6d	Wis.	4-4½x5½	Eise.	Bijur*	Simplx.	Mast.*	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 129	6	5,250	36x6	40x12	Wis.	4-5½x6	Eise.	Bijur	Simplx.	Mast.*	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 149	7	5,500	36x6	40x7d	Wis.	4-5½x6	Eise.	.....	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn.
Winther, 439	1½	2,100	32x4	32x4	Gray	4-3½x5	Eise.	.....	.....	Mast.	B.&B.	B-Lipe	in-g.	Clark	Ross
Winther, 499	3½	4,900	36x5	36x5d	Wis.	4-4½x6	Eise.	Bijur	.....	Mast.	Fuller	Fuller	worm	Shel.	Lavn.
Wisconsin, B	1½	1,750	34x3½	34x4	Wauk.	4-3½x5½	Eise.	none	Wauk.	Mast.	Fuller	Fuller	worm	Shel.	Lavn.
Wisconsin, C	2½	2,850	36x4	36x6	Wauk.	4-4 x5½	Eise.	none	Wauk.	Mast.	Fuller	Fuller	worm	Timkn.	Ross
Witt-Will, WD-16	1	1,850	36x3*	36x4*	Cont.	4-3½x5½	Eise.	.....	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Witt-Will, WD-18	2½	2,850	36x3½*	36x3½d	Cont.	4-4½x5½	Eise.	.....	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Wolverine, C	1½	2,250	34x3½	34x5	Cont.	4-3½x5	Split.	G&D*	Mon.	Strom.	Fuller	Fuller	in-g.	Russel	Gem.

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Beav., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West., Westinghouse; L-N, Leece-Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx., Simplex; McCan., McCanna; Rugles, Ruggles. **Carbureter**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe, Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming; W. G. Co., Warner Gear Co. **Gearset**—B-Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H, Keystone-Hindley; Shel., Shelden; Salsby., Salisbury; Ind., Industrial; Chgo., Chicago-Standard; Chgo., Chicago; W-W., Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.



The Essex roadster has all the characteristics of the larger car

Essex Roadster Now Out

Smaller Model on Same Chassis as Five-Passenger Touring Car Model

Designed for Carrying Load in Rear Deck

THE Essex roadster has just been announced. It has all the characteristic earmarks of the Essex five-passenger, is built on the same chassis as the larger car and has its body design carried to the same point of streamline completeness.

The large turtlebacked compartment makes the car useful to the business man, permitting trunks, sample cases and the like to be carried. This turtleback is made accessible by removing the cover, which is held down by lock screws. Access to the compartment also can be had by lifting the small lid which is part of the large cover.

The car carries two passengers besides the driver. The seat arrangement permits of a very low weight carrying center. One of the little features of the car which demonstrates the thoroughness of the design is the manner of securing the top brackets. The top hangers are not attached permanently to the body as is so often the case. When the top is up the hangers are removed, leaving nothing to mar the symmetry of the body contour.

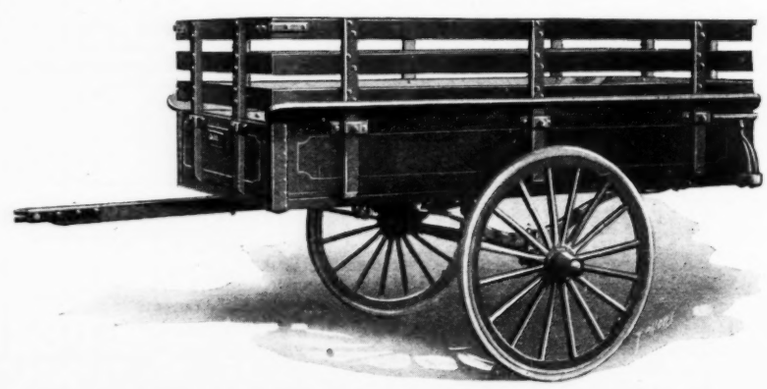
NEW MILES TRAILER

THE Miles Mfg. Co., Jackson, Mich., is marketing a model 20 trailer of the two-wheel type with combination delivery and rack type of body. The trailer sells for $150 and has a capacity of 2000 lb. It is mounted on 1¾-in. tires.

The dimensions of the delivery body with the rack removed are 86 in. long, 42 in. wide and 13 in. deep. With the rack the depth of the body is 25 in. The racks may be removed in four separate pieces and the rear rack acts as a part of the drop-end gate.

The axle is a ball bearing type, drop forged. It is equipped with 43 by 1½-in. springs, seven-plate type, with heavy shackles and axle clips. The drawbar is a heavy hickory pole reinforced with steel and is adjustable to any height frame.

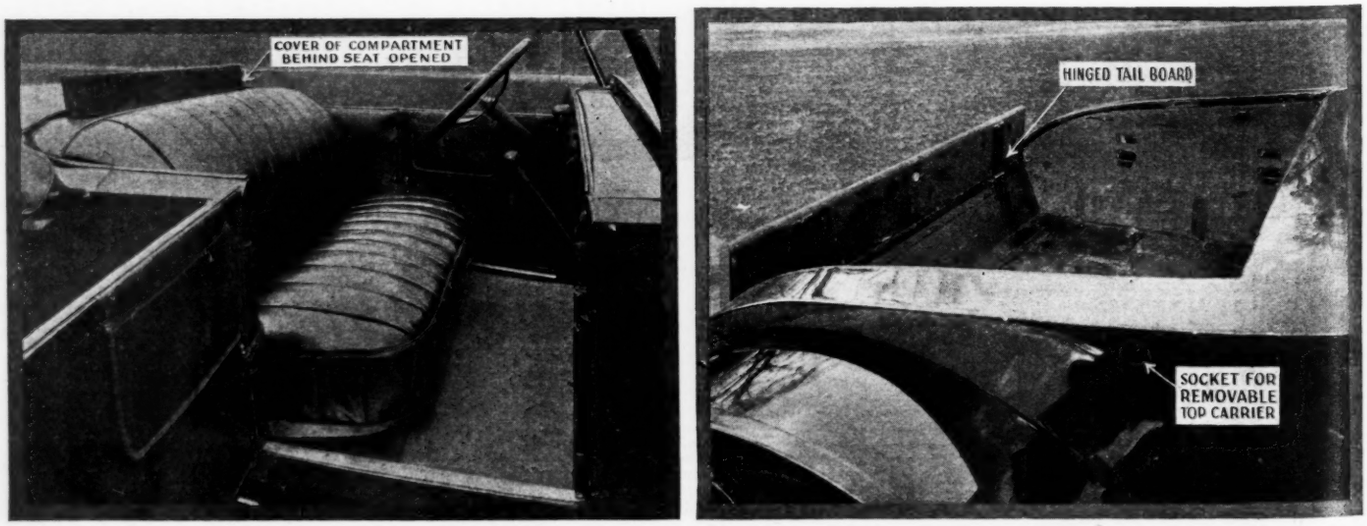
The trailer is painted Brewster green with red striping and is a four-coat job. The weight of this trailer knocked down and crated for shipment is 425 lb. If desired, the trailer can be furnished as the convertible stock rack type and a full list of attachments can be secured.



Miles model 20 trailer which sells for $150

J. H. WHITING DIES

Flint, Mich., June 6—J. H. Whiting, who brought the Buick Motor Car Co. to Flint sixteen years ago, died Monday morning at his daughter's home in New York. He had been ill nine months and was planning to return, to Flint when death came. When the Buick company, operating under the direction of David Buick, failed in Detroit, Mr. Whiting bought the plant and patents for $15,000 and brought them to Flint, where W. C. Durant became identified with the work.



Details of new Essex roadster, showing features of the turtlebacked compartment at right

Moore to Sell at $895

Five-Passenger Is Offered on 106-In. Wheelbase and with Standard Units

The Body a Product of Company's Own Plant

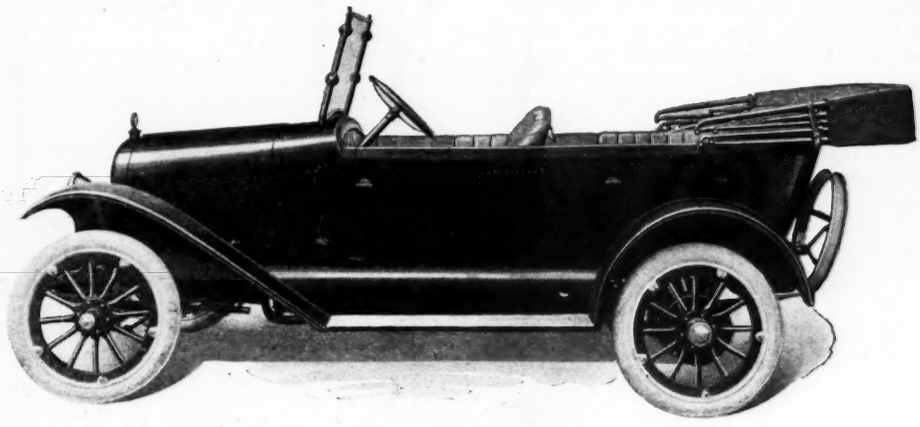
PRESENTED on a 106-in. wheelbase chassis, equipped with a four-cylinder engine made by Golden, Belknap & Swartz, the Moore five-passenger touring car, listing at $895, is one of the season's new offerings. Production at the factory in Danville, Ill., is increasing daily, the 300-car mark a day having been reached recently.

The four-cylinder engine has a bore of 3¾ by 4¼ in., which gives it an S. A. E. rating of 22.50 hp. Among the other well-known parts in the assembly of this car are the Borg & Beck clutch, the Grant & Lees transmission and the Peru rear axle. The tires are 30 by 3½ in. all around. The fuel is contained in the rear tank and led from there to the carbureter through the Stewart vacuum feed tank. The rear tank is of 12-gal. capacity.

For starting and lighting the Auto-Lite two-unit system is used. The generator is mounted on the front end of the engine and the starting motor at the rear, engaging directly with the teeth on the flywheel.

The rear axle is of the floating type with two bearings in each hub. The differential is carried on two ball bearings, and the thrust on the driveshaft also is taken through a ball bearing. The Hotchkiss drive is employed, the torque being taken through the semi-elliptic springs. The front springs are of the semi-elliptic type also.

The brakes are slightly different from the ordinary, in that the control of the brake is through a flexible steel cable. Each set of brakes operates independently of the other. Equalizing is taken care of through a sheeve mounted on the front end of the brake lever. This construction of the brake control makes adjustment very simple.



The Moore car, a new offering of the season

The body of the car is made completely in the Moore factory. The design is of the latest accepted standards in body designing, having a beveled edge and a square corner at the rear, the whole being streamlined to fit the contour of the hood. Upholstery is of duPont Fabrikoid with the warranty of the duPont company behind it. The windshield is slanting, of rain-vision type, and has large wing nuts to enable it being easily set at any angle. The floorboards and runningboards are equipped with Congoleum, while the tonneau is equipped with a carpet rug. The instrument board carries the new type Stewart speedometer, with large numerals on the dial, and has the switches and instruments mounted so as to be perfectly visible to the driver.

The fenders are made from sixteen-gage steel and are of the crown design. Front fenders are attached to the chassis with heavy channel iron supports, whole rear fenders are bolted to the body.

The top of the car is made in the Moore factory also and is of Fabrikoid. The side curtains are the inside type and are carried in the top.

The Wilson cultivator, which is fitted with a four-cylinder engine

Wilson Cultivator

THE Wilson two-row motor cultivator, which is manufactured by the Wilson Tractor Co., Peoria, Ill., is being introduced to the Illinois trade by the Parret Machine Co. of the same place. It is a three-wheel cultivator with a triangular frame, substantially constructed from channel and angle steel. At the front of the frame a semi-steel casting forms the steering gear retainer and the front axle pivot.

The Wilson has a four-cylinder vertical engine with bore and stroke of 3½ by 4½ in., with pump system of lubrication and controlled by centrifugal type governor. The engine has a normal speed of 1000 r.p.m. and is set crossway of the frame. Ignition is Eisemann high-tension magneto, and a Kingston carbureter with air washer is regular equipment.

The clutch is disk type, built into the flywheel, with a service brake at the end of the throw-out, both clutch and brake being controlled by the same lever. The gearset is selective sliding gear type, inclosed in a dust-proof case and running in oil. All bearings are anti-friction.

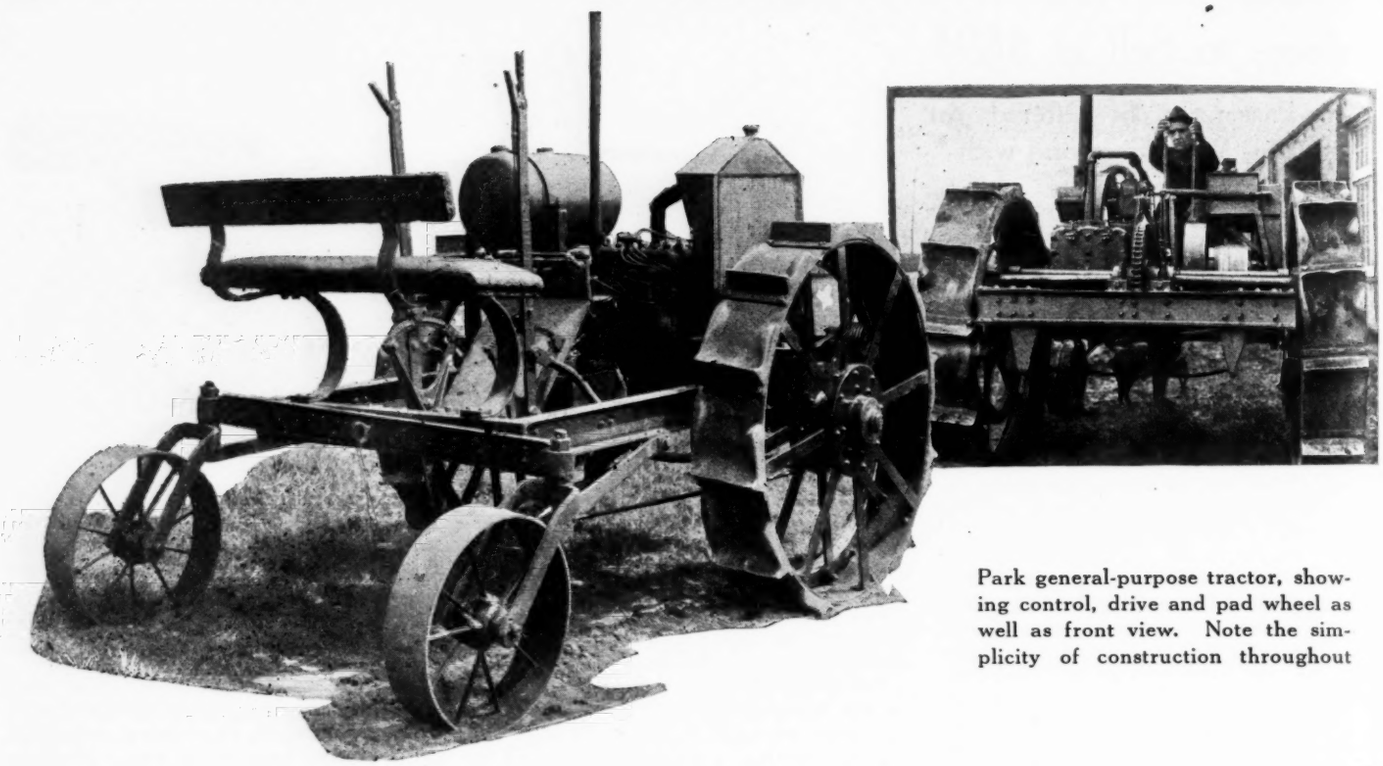
Final drive is internal bull pinion to segmented bull ring bolted to rim of drive wheels. The machine has two speeds forward and one reverse, the forward having a range of ⅞—1.3 m.p.h. to 2¾—3⅝ m.p.h.

Pulley Equipment

The Wilson is equipped with a 6½ by 7-in. pulley so situated that the machine can be backed into the belt. The pulley is controlled by the same clutch that controls the drive wheels. Brake drums, with 2-in. bands, are placed on the bull pinion shaft, one on each side, and either can be operated independently, locking one of the wheels for short turns.

The front wheel is 30 by 5½ in., and the drive wheels are 44 by 4½ in. The wheelbase is 75 in. and the tread 88 in.

It is claimed by the manufacturer that it is possible to cultivate from 15 to 22 acres of corn a day with the Wilson and that it can be used for pulling a hay loader, rake, planter, disk harrow, grain drill, binder and the like. On the belt it may be used to drive any belt machine up to the power capacity of the engine.



Park general-purpose tractor, showing control, drive and pad wheel as well as front view. Note the simplicity of construction throughout

Tractor Without Clutch or Gears of Any Kind

Park Is Simplest in Field—Uses Duryea Drive—A General-Purpose Machine

"NOTHING to break and nothing to get out of order" probably will be the keynote of the company's advertising when the Park Tractor Co., Chicago, gets ready to announce its new general-purpose tractor. The Park is a tractor without steering gear, without clutch, without transmission, without gears of any kind—it is the simplest thing in the tractor field.

The Duryea drive, controlled by the company as far as its use on tractors is concerned, is the fundamental feature of the tractor. With a leverage which will insure firm contact between the bull pinion shieves and the driving rings on the inside of the rim of the drive wheels, the tractor will operate just as long as the engine, which is set crossway of the tractor frame, runs. The final drive is positive.

Tractor Drives Direct

The tractor drives direct from the crankshaft of the engine by sprocket chains. There are three reductions. A chain extends from a sprocket wheel on the engine crankshaft to the jackshaft on which the pulley is mounted. Another chain extends from the pulley shaft to the sprocket wheel in the center of the driveshaft. Finally there are the drive shieves on the ends of the driveshafts. These drive pinions are grooved and have side contact with the drive and reverse rings on the drive wheels.

The two levers at the right and left of the driver are connected to the driveshafts by long curved tubes. The length of these levers permits a heavy pressure to be brought to bear between the drive pinions and the drive rings. The necessary elasticity is provided by the long tubular connection. Universal joints are at the inner ends of the driveshafts.

The tractor drives and steers with the same mechanism. By releasing one of the levers one wheel is released and the tractor drives from the other, turning in a circle with radius equal to the tread of the machine. By reversing one wheel and allowing the other to drive forward the machine may be turned in a circle of radius half the tread of the tractor. The machine is extremely sensitive and responds instantly to the control.

Reverse rings fit inside the forward driving rings on the drive wheels. The bull pinion shieve fits closely between these two rings and can be shifted from one to the other by a movement which is only the fractional part of an inch. Manifestly there can be but one speed forward and one reverse, but this will depend upon the speed of the engine.

The carrying wheels at the rear caster and under load have but little to do. The swing drawbar, with both vertical and lateral adjustment, is attached in front of the main axle and when the tractor is pulling a load the tendency is to increase the weight on the drive wheels and take it off the rear carrying wheels.

A feature of the tractor is the pad wheels. There is nothing else just like them in the tractor field. As a matter of fact the pad was molded on the pattern of a cupped human hand, and it is claimed for it that soil packing is an impossibility no matter what the condition of the soil may be.

Another feature is the wide lazy back seat. There is room on this for three persons.

The Park has a clearance of 25 in. and is designed for a general-purpose tractor which will do any kind of work from plowing to cultivating row crops.

The perfected model will be equipped with a 4¼ by 5½-in. Buda engine. It is estimated this size will give the machine sufficient power to pull three 14-in. bottoms under average conditions, although it is the present intention of the company to put out the machine as a two-bottom tractor. Just what the total weight and the price will be are yet to be determined.

The company owns a well equipped factory at North Chicago and expects to have a perfected model ready for the Wichita tractor demonstration

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WISCONSIN TRADE MUCH BETTER

Milwaukee, Wis., June 7—The automotive business is on the boom in Milwaukee and Wisconsin. Manufacturers of cars, trucks, bodies, frames, engines, parts, accessories and supplies are working at capacity. An important local de-

velopment is the announcement of the decision of the Briggs & Stratton Co., makers of ignition devices and other parts and specialties, to double the size of its plant at an estimated cost of $500,000. The company will take over the motor-wheel department of the A. O. Smith Corp. and develop some new designs now perfected.

Tractor manufacturers in Wisconsin are increasing production once more. A month or two ago it was found necessary to make slight limitations in order that stocks might work down. The wholly unfavorable spring season in the Middle West and other sections of the country restricted the demand, and sales fell somewhat below expectations. Improvement in sales became so marked during the latter part of May and early in June that the check has been removed on output.

Arrangements for the sociability tour and "romp" of the Milwaukee Automobile Dealers, Inc., June 27-29, are going forward, and between 100 and 125 tradesmen have elected to participate.

R. E. Chamberlain, manager of the freight transportation department, Packard Motor Car Co., Detroit, spent several days in Milwaukee during the week to conclude arrangements for the local end of the four-day cruise of the Packard sales organization, which will be here June 17. The Milwaukee Automobile Dealers, Inc., will co-operate with the local Packard branch staff in entertaining the 1000 or more visitors, who will arrive at 10:30 a.m. on the steamer Naronic and depart at 9:30 p.m.

PLAN TRANSCONTINENTAL FLIGHT

Washington, June 6—Plans for a transcontinental flight directed by the Operations Division of the Army Air Service have been completed. The start will be from New York in a Martin bomber soon. The finish will be at San Francisco, Cal. The total distance is computed as 2750 miles, which it is intended will be covered in two successive days. The first and only stop will be at North Platte, Neb., giving a first leg of 1502 miles and a final leg from North Platte of 1248 miles. The pilots will be Capt. Roy N. Francis and First Lieut. Edmund A. Clune, assisted by two or three mechanics.

The condition of the territory passed over will be tabulated from the standpoint of good and bad terrain for aerial routes, and valuable information as to meteorological conditions will be gained. The reliability and the durability of the Liberty engines will be tested. The bomber will be equipped with twin Liberty twelve-cylinder engines, aggregating 800 hp.

The last transcontinental flight made by the Air Service was that of Maj. Thomas C. Macauley, who doubled the southern continental route from San Diego, Cal., to Jacksonville, Fla., between April 12 and 18, a distance of 4652 miles in 2,655 min., flying time. He made several stops en route. His eastern flight, with the benefit of a western wind, was made in 19 hr. 15 min., flying time, in a De Haviland 4 plane with a Liberty engine.

Cotta Gears Always Meshed

Double-Step Faces on Jaw Clutches Make Engagement Simple

THE outstanding feature of the Cotta transmission made by the Cotta Transmission Co., Rockford, Ill., is that the gears are always in mesh and the shifts made by jaw clutches interposed between the different sets of gears. The gear ratios are as follows: First speed, 5.2 to 1; second, 3.68 to 1; third, 1.86 to 1; direct, 1 to 1 and reverse 4.66 to 1.

On the face of the speed-change gears, which are mounted on roller bearings, is a set of jaw clutches. On the driven shaft are two corresponding double sliding clutches, by which any one of the speed change gears may be locked to the shaft regardless of the speed at which the gears may be rotating.

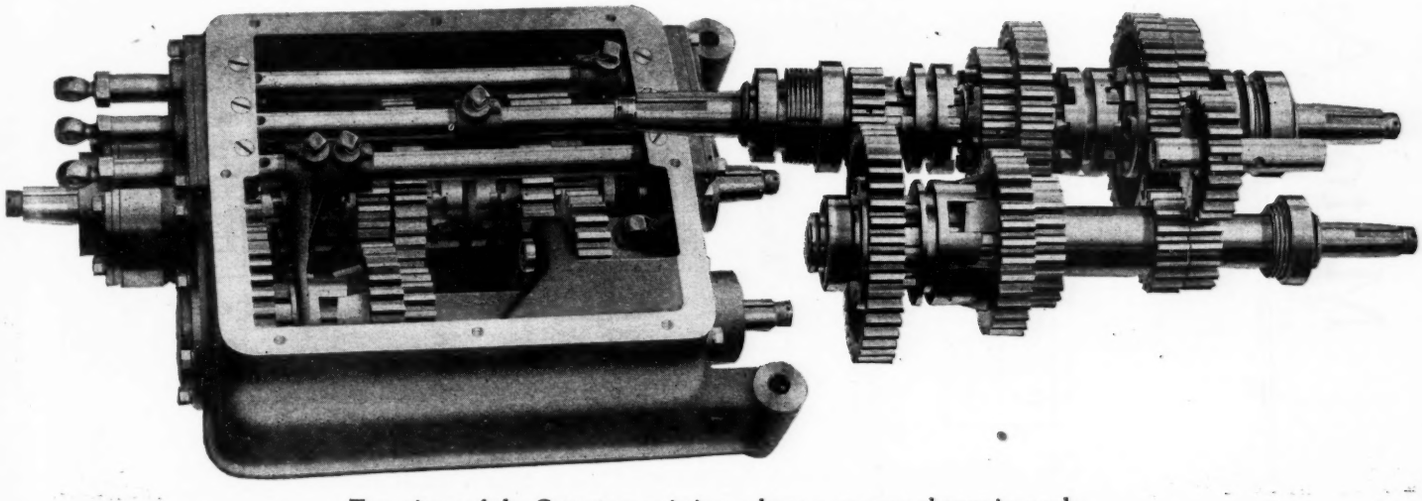
On high speed the driving and driven shafts are locked together and the clutch on the countershaft disengaged. The drive is then direct and the countershaft and all mainshaft gears, idle. When the sliding clutch is returned from direct to neutral position, the countershaft clutch automatically engages. The shifting forks are of simple design and the transmission is provided with a locking device which prevents the engagements of two speeds at the same time.

Another feature of this transmission is the provision for the working oil or lubricant in the casing away from the stuffing box of the driven shaft. This is done by a left-hand spiral thread which prevents oil from crowding and leaking through when the driving shaft is in operation.

The double-step faces on the jaw clutches insure quick and easy engagement without strain on the teeth. The result is the jaw clutches slide into mesh, six faces meshing instantly.

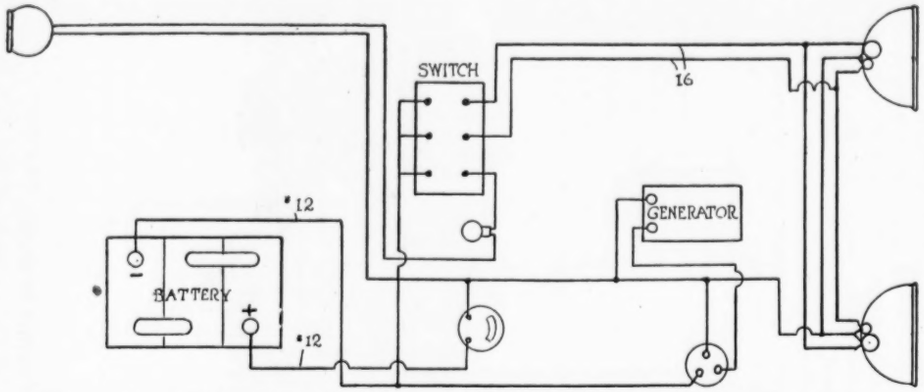
The method of keeping the lubricant within the casings consists of a peripheral right-hand oil groove formed integral with the clutch element, so that when the driven shaft is revolved in any forward speed, the right-hand thread will work the oil inwardly. When, however, direction of drive is reversed, the right-hand thread will have a tendency to work the oil outwardly and to obviate this, the manufacturers have equipped the spacing collar with peripheral spiral thread of a lead in a different direction from that on the clutch element, adapted to work the oil inwardly when reverse speed is engaged.

Locking balls or members are of such size and so arranged that upon shifting a rod lengthwise, for example, the ball will be forced out of its notch into engagement with its complimental locking ball and confined against movement in the opening between the periphery of the rod and the complimental ball, so that this rod will be locked against lengthwise shifting movement.

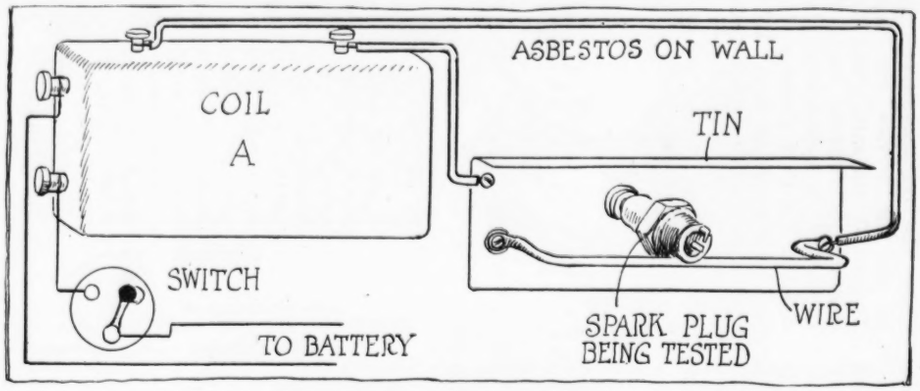


Two views of the Cotta transmission, whose gears are always in mesh

Motor Age Wiring Diagram Char No. 32

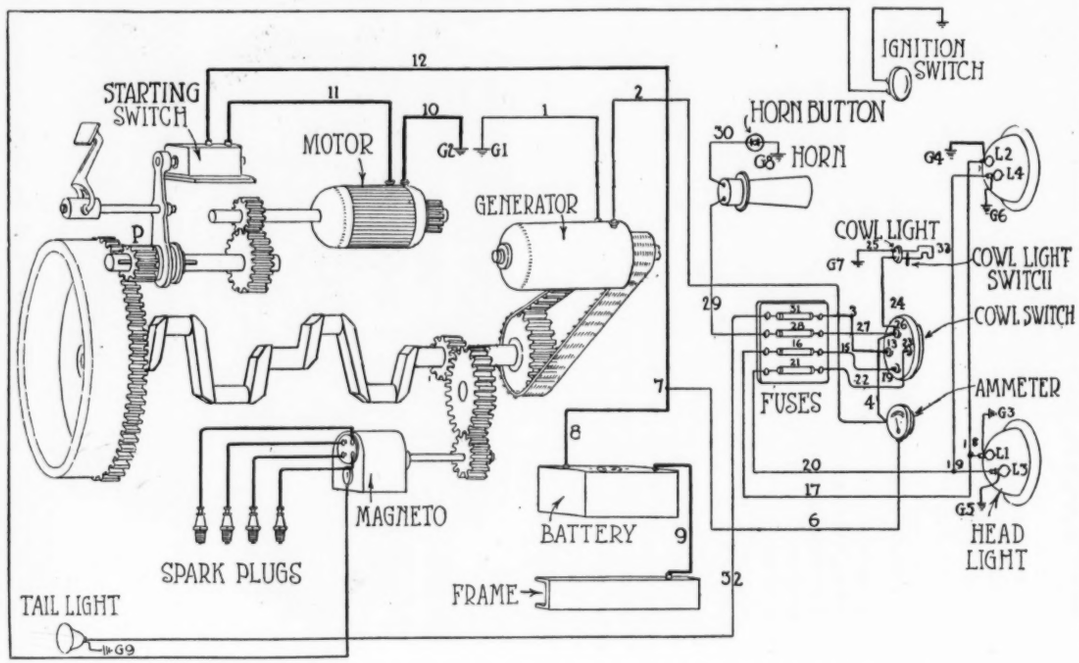


Wiring diagram showing how to connect headlights with auxiliary bulbs, ammeter, cut-out, three-gang switch, generator, taillight, dashlight and battery



Apparatus for testing spark plugs

This Week—Sundry Typical Layouts



Wiring diagram assumed as typical of all the common installations on modern motor cars

Abbott—March 26-27
Alco—April 24
Alter—Nov. 4
Apperson—March 6

Buick—Nov. 21-April 3

Cadillac—Dec. 9.
Cartercar—May 1
Cole—Jan. 23-April 3
Case—Feb. 27
Chalmers—Feb. 20
Chandler—April 3
Chevrolet—Nov. 28-Mar. 27

Davis—May 8
Detroiter—March 6
Dodge—Dec. 12
Dort—March 13

Elgin—Feb. 27
Empire—March 13

Ford—Jan. 30

Grant—Feb. 27-March 27

Henderson—April 3
Hudson—Dec. 5-May 1
Hupmobile—Feb. 13

Interstate—March 13

Krit—Feb. 6

Lexington—April 24
Little—March 20
Locomobile—Jan. 23-April 17

Maxwell—Jan. 16
Marion—March 6-20
Mercer—Jan. 23
Michigan—March 20
Mitchell—Jan. 9
Murray—May 1

Oakland—Jan. 2
Oldsmobile—Jan. 23
Overland—Nov. 7-14

Premier—April 10
Pullman—April 10

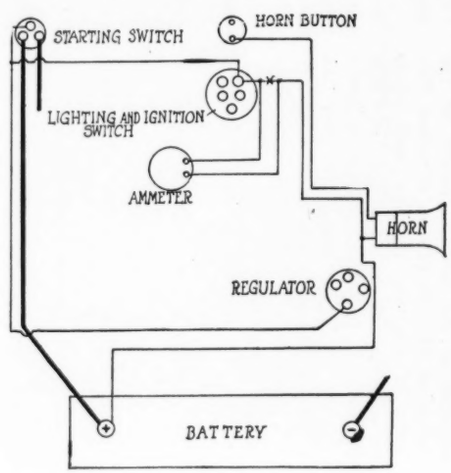
Regal—Feb. 6-April 10
Reo—Feb. 27

Saxon—April 17
Simplex—April 17
Scripps-Booth—Dec. 26
Stearns-Knight—April 24
Studebaker—Dec. 26

Velie—April 24

Westcott—May 8

Special Systems for Fords—May 15-22
General Battery Charging—May 29
General Magneto Diagrams—June 5



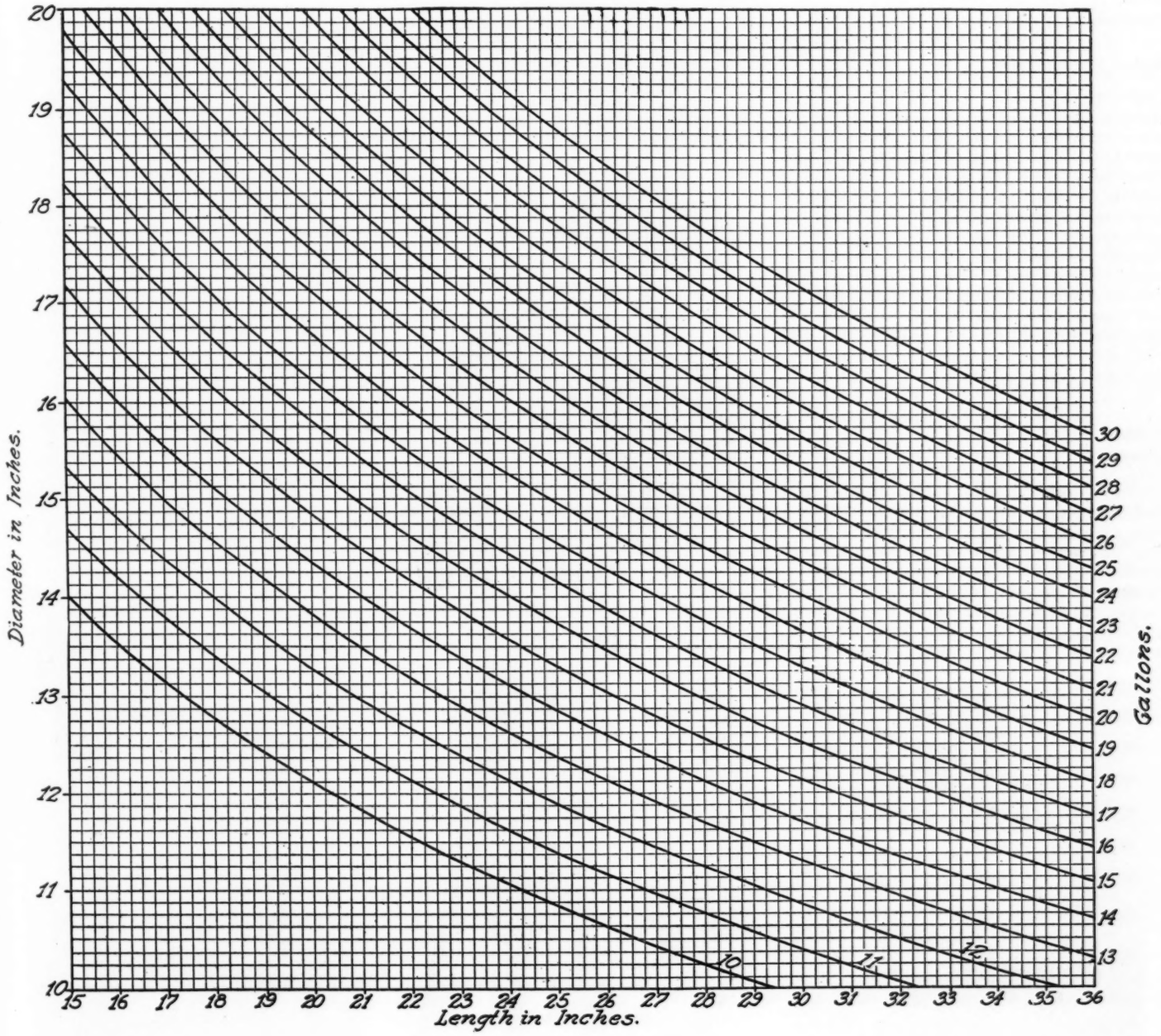
General ammeter connections

Diameter in Inches.

The Capacity of Cylindrical Tanks

A Rapid Means of Determining the Contents of Tanks of All the Usual Lengths and Diameters or the Size Required for Any Desired Capacity

The accompanying chart permits of instantly determining the cubic capacity of cylindrical tanks of different diameters and lengths. Also, if a tank of a certain capacity is wanted and the length is fixed, the necessary diameter can be determined. Lengths and diameters in the chart are inside, of course. Fuel tanks generally have bulged heads. In such cases a very approximate value can be obtained for the gallon capacity by taking the mean length, that is, half the sum of the lengths at the center and the length at the circumference.



Motor Age Maintenance Data Sheet No. 40

One of a series of weekly pages of information valuable to service man and dealer—Save this page

Service Equipment

Time Savers of the Shop

Champion Swivel Vise

THE Champion vise, made by the Western Tool & Mfg. Co., Springfield, Ohio, is adjustable in all directions. It can be raised to any height, can be swung to any angle and permits the workmen to do much more accurate work. One swivel lock instantly tightens all the working joints. It is not necessary to mutilate the bench to attach the vise. The device is made in several sizes, the jaw opening 2½ to 8 in. and ranging in price from $7 to $25.

Valve Spring Lifter

The Bryant valve spring remover and lifter is distributed by Stevens & Co., 375 Broadway, New York. With this holder it is possible to compress the spring and then the holder with the compressed spring between the jaws. There is no slipping out of the spring after it is once compressed. The jaws are opened or spread by turning a socket wrench, which is furnished with the device. It can be used in inaccessible places without removing any of the parts to place the lifter in position.

Capillary Oil Filter

The capillary oil filter made by the Million Motor Co., Adrian, Mich., is designed to rid the service station of the used and dirty oil that accumulates around the shop. After the oil is filtered and cleaned of its impurities it can be sold again as machinery lubricating oil. The oil passes through a series of fine mesh screen wire filter cloth and then further is filtered by passing over a series of wicks made of fibrous material, the purpose of which is to remove the fine material that the screen does not remove by the force of capillary attraction.

Threading Tool Holder

The threading tool holder made by J. H. Williams & Co., Brooklyn, N. Y., is about the right-sized tool holder for the average service station. It is made purposely for thread work, so that the shop need never be out of bolts of odd sizes, for one can be turned up in a hurry. When the holder or the cam lock is loosened the tool has a spring head which is necessary for finishing work.

Air-Cooled Water Still

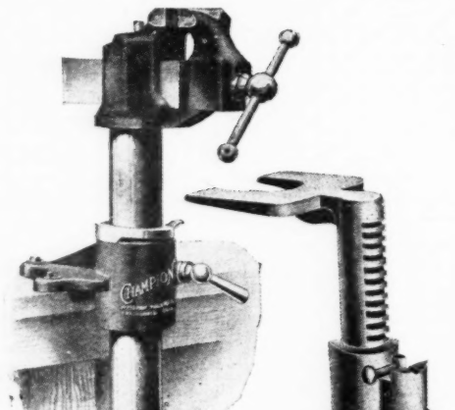
The garage desiring a cheap and easy way to operate water still will find one in the Ballman Whitten Mfg. Co.'s air-cooled water still, made in St. Louis, Mo. This still does not need a water supply to condense the steam after it is vaporized. The still can be set on any burner of a gas or oil stove. The supply tank is filled with water to replenish what is drained off. The device is made of sheet copper and coated with tin.

Steel Bench Supports

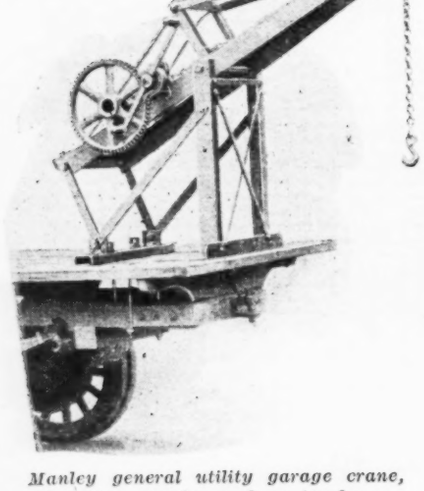
The New Britain Machine Co., New Britain, Conn., maker of shop furniture, is offering pressed steel bench legs for the support of the shop bench. A rigidly supported bench is worth while even if the cost is a little higher than the old method of making the bench out of leftovers. A bench equipped with these pressed steel legs can be moved readily. The U-shaped section underneath, with the flanges facing each other, enables the bottom shelving as well as the bench top to be held rigidly.

Universal Garage Crane

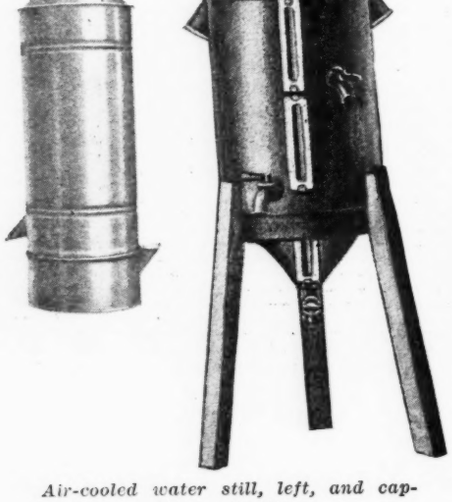
The Manley general-utility garage crane is widely adaptable. It can be used on service trucks, as the illustration shows, as well as in the garage, by applying the base to it which is equipped with wheels. As a wrecking crane when attached to the service truck it has a capacity of 2 tons and as a floor crane the capacity is 1½ tons. This crane is made by United Engine & Mfg. Co., Hanover, Pa.



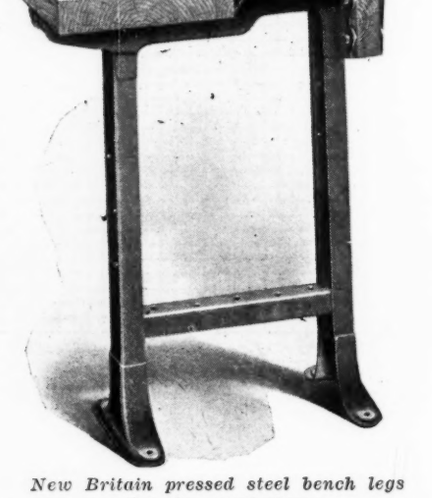
Champion swivel vise, left, and the Bryant valve spring lifter



Manley general utility garage crane, which can be used on trucks



Air-cooled water still, left, and capillary oil filter



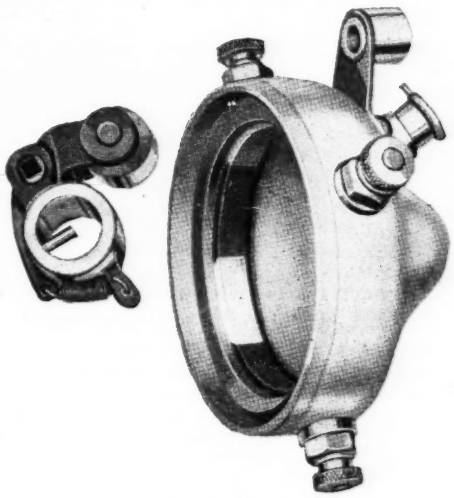
New Britain pressed steel bench legs for the repairshop

The Accessory Corner

New Fitments for the Car

Milwaukee Ford Timer

THE Milwaukee timer made by the Milwaukee Auto Engine & Supply Co., is made for all models of the Ford car from 1909 to 1919, as well as the Fordson tractor. The case is a one piece steel stamping and is fitted with a one piece insulating ring made of Egyptian gray fiber. The machine work on this timer is very accurate, the roller fitting in a cut groove so that bearing on all sides is made possible. The roller is made of hardened steel, ground and polished. The price of the outfit is $2.



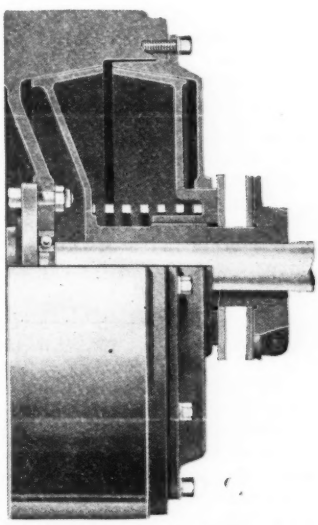
Milwaukee timer for Fords

Tillotson Carbureter for Fords

The Tillotson Carbureter Co., Toledo, Ohio, recently has perfected a new carbureter for Fords. To install, it is only necessary to have a bicycle wrench and screwdriver and a few minutes' spare time. There is only one adjustment on this carbureter, and this controls the low-speed fuel nozzle. The principle of this carbureter is the same as that used in carbureters for larger cars, the metallic reeds opening and closing and shutting off the air supply in accordance with the demand. The price of this carbureter is $15.

Stoufer Twin Clutch

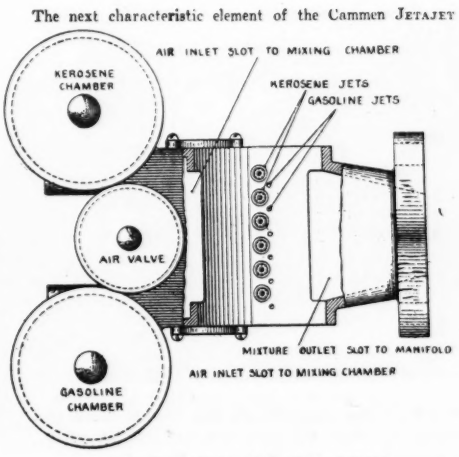
The Stoufer clutch, made by the Toro Motor Co., Minneapolis, Minn., has two cones that oppose each other and thus eliminate thrust on the bearings. The cones run in oil, and when they are drawn out of contact there is no end thrust suddenly released, which otherwise causes the engine to knock if there is any endplay present in the shaft. Everything is inclosed and runs in oil.



Stoufer twin clutch

Jet-A-Jet Carbureter

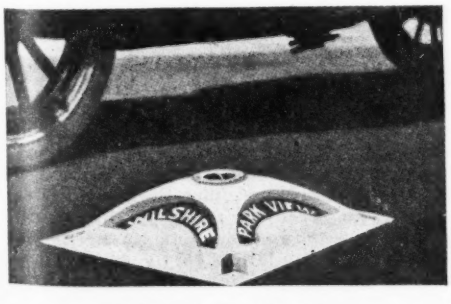
A new kerosene carbureter made by the Cammen Laboratories, 42 West Thirty-ninth street, New York, has been announced. This carbureter is unusual in that its 300 minute jets are the means for atomizing the fuel. The valve control is of the barrel type and does not shut off the passage to the manifold as do other carbureters. The only two controls are the air valve, which regulates the quantity of air admitted before it comes to the jets, and the other control, which operates the kerosene. The number of orifices delivering fuel is dependent on the position of the air control valve, so that over-richness at high speed is prevented. An auxiliary chamber is provided for gasoline starting, this being necessary for starting some of the old types of engines still on the market.



Cammen Jet-a-Jet carbureter

Friel Street Indicator

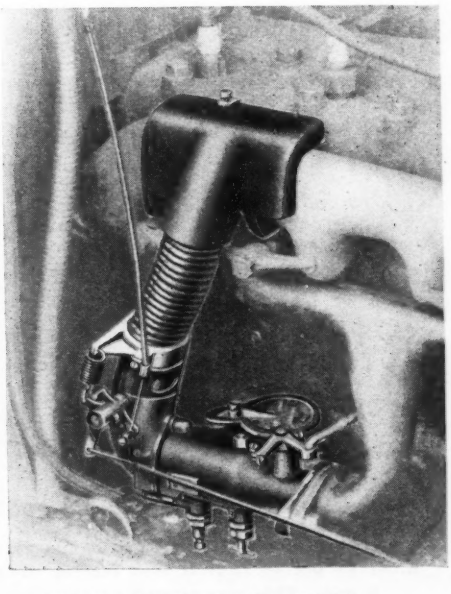
The Friel street indicator made by the California Corrugated Culvert Co., Los Angeles, Cal., is an indicator to be placed at the street crossing. When installed the sign projects 4½ in. above the street level and occupies a square space 17 in. on a side. The name of the cross street appears in white on a red background and is illuminated at night. That the sign is a convenience to the motorist is an easily appreciated fact, for he is able to read the name of the streets without removing his eyes from the road. The cost of these signs is not prohibitive and the maintenance cost is that required to illuminate a small bulb over night. A vehicle can pass over the sign without injury, it is claimed.



Friel street indicator

Goodrich Steering Lock

The Goodrich steering column lock, manufactured by the Goodrich Lenhart Mfg. Co., Philadelphia, Pa., locks the steering wheel so that it cannot be turned. The lock clamps over the steering column and the wheel held from turning by means of the lock which is Yale keyed. The price of this lock is $10 for Ford car and $12 for all other cars.



Tillotson carbureter for Fords

Among the Makers and Dealers

Short Trade Notes

CRYSLER with Commerce Motor—A. E. Crysler has joined the Commerce Motor Car Co., Detroit, as assistant to the director of sales and advertising, G. D. Wilcox.

Titus Is Goodrich Foreign Sales Manager—Frank E. Titus has been made foreign sales manager for the B. F. Goodrich Rubber Co. He was formerly local branch manager in Buffalo, N. Y.

New Plant for Hill Pump—The Hill Pump Valve Co. has purchased a site of 205,402 sq. ft. in Chicago and will commence at once the erection of a new plant. The first building will be a one-story saw-tooth roof structure.

Hawxhurst with Automotive Products—Maj. B. Hawxhurst, formerly representative of the Westinghouse company in Detroit, is now president and general manager of the automotive Products Co. of Detroit and Chicago.

Lyons Is Nelson Eastern Sales Manager—C. V. Lyons has been appointed eastern sales manager of the Nelson Truck Co., Saginaw, Mich. He will have charge of the distribution of the John Simmons Co., New York.

Collins Is Ajax Advertising Manager—A. J. Collins has been appointed advertising manager of the Ajax Rubber Co., New York. He was formerly assistant to the publicity manager of the Atlas Portland Cement Co. and succeeds Charles R. Collins.

Delco Gets New Service Manager—E. J. Graef has been appointed service manager of the Dayton Engineering Laboratories Co., manufacturer of Delco electrical equipment. Mr. Graef has been connected with the Delco company's sales department for several years.

Booth to Make Bumper—W. S. Booth, formerly of the Field Mfg. Co. and Biggam Trailer Co., has organized a new company and will begin the manufacture at Owosso, Mich., of a patented bumper. He hopes to make 10,000 this summer. The A. E. Palmer & Sons Co. will make the bumpers until he gets his own plant running.

Rude to Build at Cedar Rapids—The Rude Auto Co., Perry, Iowa, which operates branches in a number of Iowa towns, has announced plans for the immediate construction of a modern three-story plant at Cedar Rapids. It will be 80 by 180 ft.

Columbia to Declare Dividend—The Columbia Motor Co. shortly will declare a 6 per cent dividend. The company is now seeking a larger plant, as its capacity in its present plant is limited. The company started after war was declared and developed under adverse circumstances.

Post Leases Plant—The Post Tractor Co., Cleveland, Ohio, has taken a ten-year lease on a structure to be erected for that company and will pay a rental of $5,500 a year. The structure will be the first unit of a tractor plant that eventually will be increased in size as business permits.

Liberty to Build New Factory—The Liberty Motor Car Co. will build a new factory in the district adjacent to the Hudson Motor Car Co., the Continental Motors Co., Wadsworth Mfg. Co., Maxwell-Chalmers and other automotive plants. With the new factory the company hopes to double production.

Templin Joins Goodyear Tire—E. W. Templin, formerly assistant engineer of the Selden Motor Truck Co. and more recently production manager of the Bessemer Motor Truck Co., has joined the staff of the Goodyear Tire & Rubber Co. as motor truck engineer attached to the development department.

Eight Years of Garage Growth—J. F. Meeker & Son, Delavan, Ill., have completed a new garage with a frontage of 150 ft. and of the same depth. This firm opened a small machine shop eight years ago and commenced to repair cars upon a small scale. The business increased, and two enlargements became necessary. The new building is a two-story and has storage room for ninety cars. The repairshop will be in the basement. Each room and department is connected by telephone and the plant has other similar advantages.

Arthur Jones Extends Service—The Arthur Jones Electric Co., Chicago, has opened a north side service station for the benefit of customers in that section of the city.

Keystone Opens Six New Branches—The Keystone Tire & Rubber Co. has opened six new branches recently, making 124 tire stores. It is its plan to have 200 stores running before the end of the year.

Gregory to Sell Columbia—Capt. Perry Gregory, recently returned from France, has resigned from the sales department of Thomas J. Hay, Chicago Chandler distributer, and has formed the Columbia Motors Co. of Illinois to sell the Columbia in that territory.

Mohawk Opens Dallas Branch—The Mohawk Rubber Co., Akron, Ohio, has opened a new branch at Dallas, Tex. H. A. Sutton, who has been traveling this territory, will be in charge. This is the seventh branch opened since the beginning of Mohawk tire production six years ago.

McGuire Carlisle Sales Head—Clarence V. McGuire has been appointed general sales manager and advertising director of the Carlisle Cord Tire Co. In entering the company he becomes a director of the organization and a member of the executive board.

Ahlberg Opens Two New Branches—The Ahlberg Bearing Co., Chicago, has opened two new factory branches to take care of customers in territories previously handled by distributers. They are at Providence, R. I., under the direction of H. F. Woodworth, formerly at the Boston office, and at Kansas City, Mo., under the management of E. A. Hefferman.

New Manager for Cincinnati Ford—J. A. Handen, formerly branch manager of the Ford Motor Co. branch at Salt Lake City, Utah, has been made branch and assembly manager at Cincinnati, Ohio. He is succeeded at Salt Lake City by E. M. Fillmore, formerly assistant manager in Los Angeles, Cal. George C. Nichols, former manager at Cincinnati, has taken the Ford agency at Terre Haute, Ind.

Downtown Showroom for San Francisco—C. L. Fisher, distributer of Crow-Elkhart cars and Lane trucks in San Francisco, Cal., has leased space on the ground floor of the Whitcome Hotel building in that city and is opening the first downtown salesroom in San Francisco. Display room for from 50 to 100 cars is available.

Jordan Plans Extensive Construction—The Jordan Motor Car Co. has awarded the contract for additional construction costing $175,000, designed to increase the capacity 150 per cent. Five additional units are to be constructed. There will be a new two-story office building, 250 by 100 ft.; an assembly room, 100 by 300 ft.; complete new power plant, 40 by 60 ft.; a japanning building, 50 by 100 ft., and engine testing building, 30 by 90 ft. The main building will be remodeled. There

TRACTOR COMES TO RESCUE OF TRUCK—For the benefit of the truck here it must be stated that it was stalled on purpose so this Walter tractor could pull it out. This was staged by the Chicago distributer, the Mercury Mfg. Co.

will also be built additional railroad sidings and a concrete loading platform, 600 ft. long. Work is scheduled to start immediately.

Mercer Wins Spanish Prize—The dealer for the Mercer Automobile Co. in Barcelona, Spain, reports that a Mercer won first prize at a recent Barcelona exposition.

Allen Offices in Columbus—The sales and advertising departments of the Allen Motor Car Co. have been moved from Fostoria to Columbus, Ohio. R. G. Ewell, with the company for five years, is in charge of both departments.

Friede Joins Haynes—Julian S. Friede, recently released from the British Royal Flying Corps, has joined the engineering staff of the Haynes Automobile Co. Previous to his aviation service he was on the engineering staff of the Paige-Detroit Motor Car Co. In his present position he will design interiors and exteriors of car bodies.

Empire Is Reorganized—The Empire Axle Co. has reorganized with a capital of $400,000 as a subsidiary of the Watson Corp., Canastota, N. Y., with the following officers: President and assistant treasurer, O. F. Hakes; vice-president, chief engineer and assistant secretary, E. de H. Caldwell; sales and advertising manager, R. W. Foley.

Appleton Gets Larger Plant—Instead of building an addition to its present shop, the Appleton Engine Works has purchased a building and after remodeling and enlarging the structure will transfer its entire operations to the new location. The capacity will be increased threefold when the improvements are completed June 15.

To Teach Sheet Metal Working—Milwaukee trade schools will introduce a complete course in sheet metal working as the result of the acute shortage of apprentices in this trade, notably in motor car body and parts industry. At a hearing held in Milwaukee by the state industrial commission, which supervises all vocational training institutions, Milwaukee sheet metal employers said that apprenticeships for jobs paying from $1500 to $1800 a year are going begging.

Pioneer Dealer in New Quarters—The opening of the new salesrooms and service station of the Collier Automobile Co., Rockford, Ill., was a great success. The new quarters give the firm twice the floor space as the old buildings and enable it to take better care of rapidly expanding trade. H. H. Collier, the proprietor of both the Rockford and Belvidere agencies of the company, which distributes the Studebaker in Winnebago, Boone and McHenry counties, is one of the oldest and best known dealers in this territory and he takes a great deal of pride in the new headquarters of the Rockford branch of the company.

Canadian Plant for F-W-D—The Four Wheel Drive Auto Co., Clintonville, Wis., definitely has decided to establish a Canadian plant and sales organization at Kitchener, Ontario. The Canadian business is being organized as a distinct corporation with an initial capital of $200,000, of which half will be held by present F-W-D stockholders and the other half by Kitchener interests. Joseph D. Cotton, vice-president of the Clintonville company, has been elected president of the Canadian concern, the other officers of which are: Vice-president and sales manager, Henry Nyberg; secretary, Archie Kerr; treasurer, W. G. Cleghorn. Work will begin at once on the erection of a one-story assembling plant, 120 by 200 ft. The Clintonville works will manufacture practically all the parts, which will be shipped to Kitchener for finishing and assembling.

THE SIGN TELLS THE WHOLE STORY—This is typical of the whole industry and should be true throughout business. Incidentally it shows ingenuity in welcome home signs for returned soldiers and sailors

Frederickson Buys Michigan Plant—The Frederickson Axle Co. has purchased the Cutler warehouse at Benton Harbor, Mich., and will locate its plant there, employing forty to fifty men.

450 Sets of Wheels a Day—The Auto Wheel Co., Lansing, Mich., is now operating full blast and is approaching capacity. The company is producing 450 sets of wheels daily and is taking on more men.

Chandler to Increase Dividend—The Chandler Motor Car Co. will increase its dividend from $12 to $16 a share per annum by declaring a $4 quarterly dividend.

Anderson Is Lansing Body G. M.—Bruce E. Anderson, formerly with the Ideal Engine Co., has become general manager of the Lansing Body Co., succeeding Frank Thoman, who retires as manager but continues as a member of the board of directors.

More Capital for Parker—Capitalization of the Parker Motor Truck Co. has been increased from $350,000 to $500,000 in the form of additional preferred stock. Adam J. Mayer has been re-elected president, and the other officers are: Vice-president, F. H. Parker; secretary-treasurer and general manager, L. L. Newton.

Armleder Adds Salesmen—W. D. Thompson, formerly wholesale manager of the Lexington Colorado Auto Co., has joined the sales force of the O. Armleder Co. as western representative with headquarters in Denver. Jack Parker, with the Oldsmobile organization for the last five years, also is connected with the Armleder concern, and Charles F. Ward, Providence, R. I., is covering Massachusetts and Connecticut for the company. C. B. Harvey will have charge of the Middle West with headquarters in Chicago.

Southern Jobber Buys Building—The Carolinas Auto Supply House, Charlotte, N. C., has bought the building it occupies and will spend $30,000 remodeling and enlarging it. The company started a little more than three years ago with three persons and to-day it employs thirty, six of whom are on the road in the two Carolinas and Virginia. The company caters to the dealer exclusively, doing no retail trade, and is making arrangements to double the size of its buildings to accommodate its business. It is considered the largest wholesale supply house of this kind in the south.

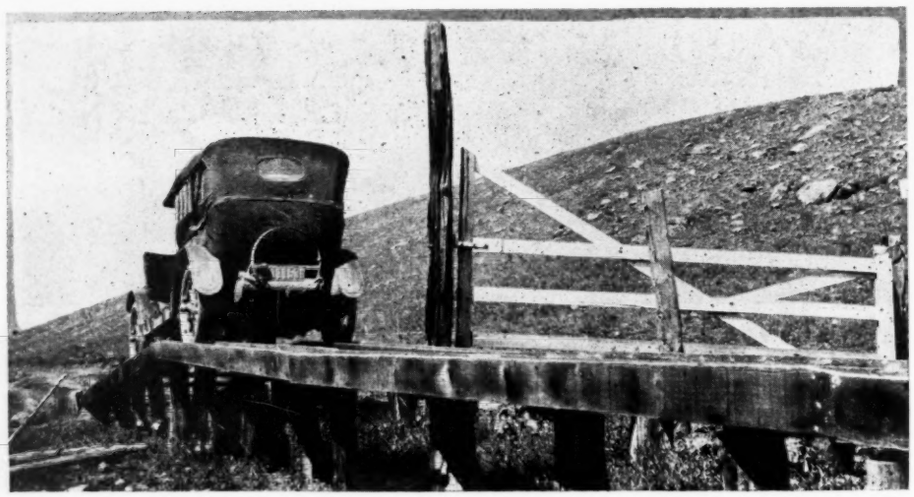
Adrian Steel Making More Starters—The Adrian Steel Castings Co., which is making a starter, has found it necessary to increase its force to meet the demand. Commencing immediately, the company will increase its day force and will maintain a night shift in the machine shop. Rough work on the different parts of the starter will be finished during the night, and during the day starters will be assembled. The company is producing approximately 100 starters a day, but with the night shift 200 daily will be turned out.

Winther Truck Plans Expansion—Important plans for effecting a large increase in the production of the Winther Motor Truck Co., Kenosha, Wis., have been perfected by the board of directors and will come before the stockholders at a special meeting June 11. The plan contemplates the issuance of $1,000,000 of common stock, most of which will be taken by present holders. The proceeds will be used to increase the facilities and otherwise finance expansion. The present plant was erected only a few months ago at a cost of $150,000, and a second unit of equal size is proposed.

Pan-American Gets Foreign Order—The Pan-American Corp., Decatur, Ill., has received an order for 200 cars from France. The buyer is Antoine Mourre, retail dealer at Paris. He will serve as distributer for the Decatur concern in France, Belgium and Italy. The first shipment of cars is to be used for demonstrating purposes. The Paris order is the largest yet received from abroad by the Decatur corporation. Efforts are now being made to secure distributers in South America as well as other countries of Europe. The plant is working overtime to catch up with back orders, and supplies are coming in rapidly, giving assurance that advanced estimates in relation to the output for 1919 will not be far out of the way.

From the Four Winds

Glimpses at the World of Motordom



MAKING THE CAR CLIMB FENCES—This rather unusual incline serves a purpose and is really very practical. All tourists are not careful about closing gates, and when gates are left open stock will pass through. This is to avoid such straying. The incline takes the car across the fence, but stock cannot cross as the incline consists of two runways for the wheels and open space between

COMMENDS National Highway Industries Association—The Highway Industries Association has received special communication from the Motor and Accessory Manufacturers' Association commending it and approving its work on the plan for a Federal Highway Council.

Japanese Roads Limit Trucks and Cars—Japanese roads and bridges are so unsatisfactorily constructed that the government is obliged to limit the weight of motor cars to 3000 lb. and trucks to 2-ton complete with the body weighing not more than 5800 lb., according to a letter received by the Highway Industries Association. A few cities and towns have streets and roads that are practical for passenger hauling but 90 per cent of these have unsatisfactory bridge conditions. The roads are narrow and it is difficult for two machines to pass excepting close to the cities where roads have greater width and two trucks can pass without scraping mud guards. The city streets favorable for cars are few. In Tokyo the majority of the streets are from 18 to 20 ft. wide. On all streets under this width a permit from the police is required for travel. There are no sidewalks. The Japanese have not become accustomed to right or left and usually keep to the middle of the road.

Five Thousand Cars to Pike's Peak in 1918—The Pike's Peak Auto Highway, the new road from Colorado Springs and Manitou to the summit of Pike's Peak, was opened to the public for the season of 1918 through to the summit on June 19, having been in operation as far as Glen Cove at timberline previous to that date, and was closed by the snows on Oct. 17. The opening of this road each summer is no easy undertaking; the winter snows between timberline and the top of the peak are very heavy and drift badly, requiring a large force of men to cut and pick through the drifts and in some places blasting the ice; some of the drifts pack so solidly that they remain throughout the summer and are a source of great pleasure to the tourist in the middle of summer. A few less than 5000 cars made the drive during the season of 1918. In round numbers 20,000 people made the trip by motor cars which was an average of four to the car.

Wisconsin Registrations Promise Record—Predictions that Wisconsin will register at least 230,000 passenger cars during 1919 are made by A. J. Cobban, supervisor of motor registry in the department of state, on the basis of the number of cars licensed up to June 1, namely, 197,000. In addition 8100 trucks have obtained certificates. In 1918 the total car registry was 189,000, with 6800 trucks additional. Applications are being received at a rate which makes it appear that the 1918 car figures will be exceeded by 35,000 to 40,000, and the truck figures by 3200 to 3500.

Massachusetts Getting After Jitneys—Because of a regulation made by the Public Service Commission governing jitneys there has been a lot of trouble in Massachusetts cities lately. The board, which has jurisdiction over railroads, trolleys, etc., came out and stated that jitneys should not be allowed to operate on the roads until they had filed a bond of $2,000 in some cases, or $500 per passenger carried in others. Cities and towns were asked to accept this interpretation through their local councils or selectmen, and then issue license to those who applied.

Wilmington May Have Show—A proposal has been made to representatives of the Wilmington Automobile Trade Assn., Wilmington, Del., succeeding the Wilmington Automobile Assn., that a motor car show be held at the Delaware State Fair, the first week in September. All of the space under the grand stand, which is really a large building, has been offered for the purpose. While definite action cannot be taken now a number of dealers have already put in bids for space. The usual winter show had to be called off this year because of inability to get a suitable building.

Wisconsin Raises Country Speed Limit—Wisconsin has joined the ranks of states which have raised the maximum speed of motor vehicles permissible on country highways to 30 m. p. h. The former limit was 25 m. p. h. The motor code relating to speed is otherwise unchanged, the maximum in cities and villages being left at 15 m. p. h., with the further condition that no motor vehicle be driven recklessly or at a rate of speed greater than is reasonable and proper, having due regard to the width, traffic and use of the highways and the general and usual rules of the road. This condition has been a feature of the Wisconsin motor code since its adoption. While maximum limits are fixed, the immediate circumstances are made to serve as the determination of the proper rate of speed.

Coming Motor Events

MEETINGS

Ottawa Beach, Mich.	Society of Automotive Engineers	June 23-27

TRACTOR DEMONSTRATIONS

Denver, Col.	Sectional Tractor Demonstrations	June 9-14
Wichita, Kan.	Automotive Committee of National Implement Assn.	July 14
Aberdeen, S. D.	Sectional Tractor Demonstrations	Aug. 18-22
Ottawa, Ont., Canada	Inter-Provincial Plowing Match and Tractor Demonstrations	October

RACES

New York	June 14
Tacoma, Wash.	July 4
Cincinnati, Ohio	July 5
Uniontown, Pa.	July 19
New York	July 26
Elgin, Ill.	Aug. 22-23
New York	Aug. 23
Uniontown, Pa.	Sept. 1
New York	Sept. 20
Cincinnati, Ohio	Oct. 1